CHEMICAL & METALLURGICAL ENGINEERING

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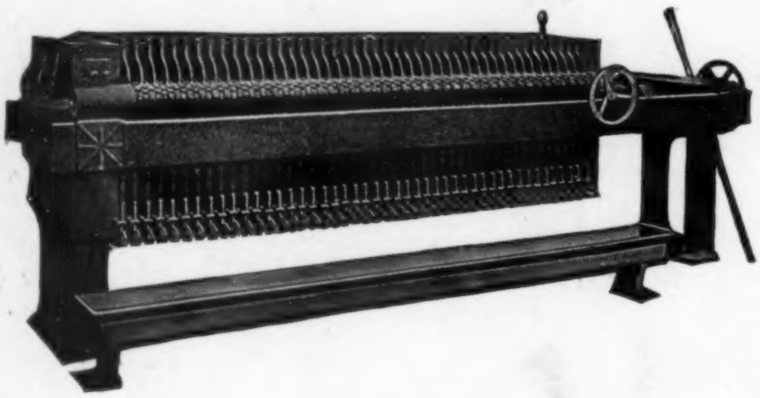

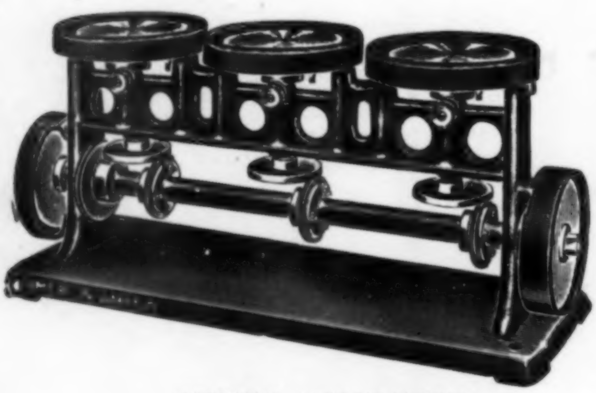

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CHEMICAL & METALLURGICAL ENGINEERING

H. C. Parmelee
Editor

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Support Needed for A Great Undertaking

THIS is addressed to executives of industrial companies in the United States and to members of their technical staffs. It relates to their vital interest in the International Critical Tables of Chemical and Physical Constants, a project undertaken by the National Research Council about 4 years ago. This project is now nearing completion, but requires for its speedy consummation additional pledges of about $15,000. *Chem. & Met.* presents this matter to American industry and urges its support solely as a co-operative investment that will yield results impossible of accomplishment through individual effort.

The experience of American industry with intensive research during the war revealed a woeful lack of quickly available fundamental data and emphasized the necessity for an exhaustive English compilation of physical and chemical constants. The National Research Council sponsored the idea and undertook to raise the sum of $170,000 for the production of the Tables. Through the self-sacrificing efforts of committees and individuals all but $15,000 of this amount has now been pledged and the success of the project is practically assured. Up to date 180 pledges have been obtained, aggregating $155,000. Generous support has been accorded by the Carnegie Corporation of New York, the International Education Board and many leading industrial companies.

But the goal is not yet reached and a final effort is now being made to complete the budget before 1924 expires. Unfortunately the list of contributors discloses some surprising gaps, not only as to individual companies whose support might almost be taken for granted on account of the benefit they must inevitably enjoy when the task is done but also in the case of whole industries that apparently are not alive to the opportunity presented. With these gaps filled, the sum now sought will be speedily subscribed and a wide distribution of the Tables assured at low cost.

While the publication of the Tables is an American enterprise, the project is international in the scope of its contributors. Three hundred experts throughout the scientific world are engaged in critically reviewing and compiling data that must be of inestimable value to American industry. In what other way can a comparatively small contribution command such an array of scientific talent? Through what other channel can money be spent to obtain the services of so eminent a body of consultants at so light a cost? The obvious answers to these questions show why *Chem. & Met.* is convinced that executives are justified in regarding contributions to this project as an investment and why technical men can wholeheartedly urge their employers to support the Tables. Industry needs them if progress is to be sure and rapid, and we express the hope that the present opportunity will be recognized and seized by those who have not yet contributed. Let the year 1924 witness the subscription of the full amount so that prompt publication and early distribution will no longer be delayed.

Selling American Equipment To the Foreign Buyer

MANUFACTURERS of chemical engineering equipment in this country have sometimes met with little success in their efforts to develop a paying export business. A variety of reasons has been ascribed for these unprofitable experiences, yet seldom has the actual method of selling been held accountable for its share in the responsibility. For this reason it may be of interest to look critically at the methods developed by one equipment maker who has succeeded in building up a foreign trade of considerable volume. Basically his methods are little else than applied common sense—yet they involve a praiseworthy attention to details that has precluded many costly mistakes.

Four essentials must be met. In the first place, the equipment involved must be indisputably adapted to the purpose for which it is recommended and equal to or preferably superior to the domestic or competing foreign product. Secondly, the salesman handling this equipment cannot afford to be superficial in his knowledge of it. He must be a walking unabridged dictionary of relevant facts as far as his product is concerned. To cable home for advice on questions asked by a prospective purchaser is invariably damaging if not fatal to the sale. Thirdly, negotiations should preferably be made in the native tongue of the country in which the salesman finds himself. To attempt correspondence or conversation in English is foolhardy. Wording contracts in the language of the purchaser is one of the sure ways to minimize the possibility of misunderstanding. Finally, and perhaps most important, is the point that has been stressed many times before: The average foreign buyer is accustomed to long-term credits and in most cases will absolutely refuse to do business on any other basis. It is only by meeting this situation with a willingness to accept terms entirely different than those under which domestic business is transacted that competition can be overcome.

We have also pointed out in these columns the necessity for observing to the letter the customer's wishes regarding packaging and manner of shipment. He probably has very good reasons for specifying shipment in a certain type of crate, and if solid boxes of odd dimensions are actually sent, it may result in a costly difference in tariff.

Observation of these essential details, backed by a thoroughly square financial policy, has brought many profitable orders to one equipment manufacturer. Fortunately, the damaging shortsightedness of certain glib and superficial salesmen, who have in the past repre-

sented American firms abroad, has not entirely ruined prospects for newcomers in the export field. Provided always that tact, patience, competent technical knowledge and a sincere desire to develop a permanent business underlie the application of these selling methods, the problem of marketing American equipment abroad is by no means unsolvable.

Publicity as a Favorable Factor in Industrial Development

CATASTROPHES in olden times were invariably considered as evidences of the displeasure of a supernatural being. An "act of God" has been defined as a direct, sudden and overwhelming effect of natural causes, such as could not by human ability have been foreseen; or if foreseen, could not by human care and skill have been avoided. With the aid of a scientific appreciation of the material basis of all "phenomena," with the spread of education in spite of the well-meant efforts of William Jennings Bryan and like-minded fundamentalists, and with the keener cultivation of human ability, care and skill, "acts of God" are becoming less and less frequent. Occasionally, however, a calamity occurs and an accounting of facts and circumstances is necessary.

At Avon, Calif., recently, six men were burned alive and a seventh was drowned as a result of a fire that destroyed an oil tanker and other property in the vicinity. The fire started by the ignition of oil flowing from a broken pipe connecting the ship to the storage tanks on shore. The ignition of the oil was caused by the arcing of electricity between the wires that carried current to the wharf lighting system. The snapping of the wires and the breaking of the pipe followed the collapse of the wharf, caused, in turn, by the unseen activities of the *Teredo navalis* borer, a destructive mollusc, on the wooden piles of which the structure was composed. Moreover, the *Teredo* cannot live in fresh water, and the dry season just concluded permitted the destruction to proceed at maximum speed. This train of accessory circumstances—which led to the loss of seven lives, a tanker steamer, a barge, a wharf and several thousand barrels of oil—formed an aggregate cause for the disaster. The sequence of events could have been foretold with comparative accuracy if a study of probable happenings had been made beforehand. Collapse of the wharf had been anticipated; it was reported that a contract had been let for its rebuilding only a few days before the intervention of the inevitable.

These facts prompt a little moralizing as to the fundamental reason for neglect to take every possible precaution. A case in contrast will make the point clear. Many years ago it was realized that the strength of the wharf structures alongside and under a large portion of the immense California & Hawaiian sugar refinery at Crockett, not far from Avon, was being seriously reduced by marine borers. A scientific study of the problem was made. One of the officials of the company, A. A. Brown, construction engineer, has served and is serving in an active and leading capacity on a committee of investigation known as the San Francisco Bay Marine Piling Survey, which, in co-operation with the National Research Council, published an annual progress report. The California & Hawaiian company has beaten the *Teredo*, for the time being at least, by substituting concrete for wood as pier foundations; and the final stages of the work, which has involved immense expense—several million dollars—is approaching completion. The construction program is an insurance, in so far as present knowledge goes, against disaster from causes similar to those that involved the loss at Avon, although the hazard is less; but it does not provide against the result of inadequate protection elsewhere in the vicinity.

In summary, it is pertinent to compare the two industries in question and the general policies underlying the operation of each. Oil refining is practiced in strict seclusion; the public is rigidly excluded by barbed wire and fence. There may be good cause for this, but the effect is to encourage a disregard for those financial considerations that appeal to the "man in the street" as good business and sound logic. The price-cutting war that exists among oil-refining companies is a factor in prohibiting the extraordinary expenditure of capital on developments that spell permanence and freedom from interruption to normal output.

The Crockett sugar refinery, on the other hand, is built to guarantee, in so far as human ability, care and skill are concerned, a steady and economical supply of an essential food product. It competes with many a museum as a show place for visitors, technical and lay. Details of the program under way to beat the *Teredo* are as fascinating to the casual observer as the various phases of processing prior to the production of a cube of pure sugar or the measures taken by the company to brighten the private lives of its employees, to encourage inventive initiative and to minimize the danger of bodily injury while they are at work. The public, as a result, learns to respect the enterprise and those who have been responsible for its economic achievements in the application of science—organized common sense—to industry.

A little more scope for general inquisitiveness of a normal kind in industrial operations, for the formation and airing of comment on hazards and general conditions, would serve to encourage the introduction of preventive measures and insure the avoidance of many a disaster.

Putting Enforcement Where It Belongs

IN STRIKING contrast with the Anti-Saloon League's tempestuous demonstration staged before the President and the Attorney-General in the interest of the Cramton bill was the calm and deliberate reflection on this subject by the United States senior Circuit Judges, assembled in Washington, under the chairmanship of Chief Justice Taft. These well-seasoned and unprejudiced observers recommended that the present Prohibition Unit be transferred to the Department of Justice. The policing and prosecuting functions of prohibition enforcement would thus be removed from the Treasury Department and be turned over to the agency responsible for enforcing all of the nation's laws. In the opinion of the federal judges this change would make prohibition enforcement more effective. In our own opinion it would also help to relieve the legitimate users of industrial alcohol of a burdensome control that at times has hampered and obstructed their progress.

In respect to the latter consideration the judges' recommendation differs basically from the Cramton bill, which was passed by the House and is now pending in the Senate. It will be recalled that the Cramton measure establishes an independent bureau within the Treasury Department and puts at its head the Prohibition Commissioner, whose rulings may be appealed only to

the Secretary of the Treasury. Under the present arrangement obstructive tactics on the part of the Prohibition Commissioner are subject to the review of the Commissioner of Internal Revenue, and on numerous occasions the industrial consumers of alcohol have taken advantage of this right of appeal. The Prohibition Commissioner has apparently found it easy to lose sight of the dual purpose of the enforcement act and the fact that it specifically provides for placing "the non-beverage alcohol industry and other industries using alcohol as a chemical raw material or for other lawful purpose upon the highest possible plane of scientific and commercial efficiency."

The administration of the provisions for industrial and tax-paid alcohol is primarily an excise function and as such should be handled by the Treasury Department, especially since it has the technically trained personnel and highly specialized experience in this work. Prohibition enforcement, on the other hand, is primarily a policing function and as such would seem to belong to the Department of Justice, wherein exists the organized machinery for apprehension and prosecution. The proposal of the senior judges, viewed from any angle, is a logical answer to those overzealous and impractical friends of prohibition who would throttle legitimate industry with a measure such as the Cramton bill.

Some Efficient Safety Organizations

WE WERE being shown rather hurriedly through an oil refinery some time ago and had stopped for a moment to wonder about some brilliantly painted signs that were evidently intended to preach little sermons on the value of safety and of the dire consequences of industrial accidents. Noting our curiosity, the guide offered this explanation: "Yes, the wife of one of our vice-presidents visits the plant every year and these pretty signs you see are all painted and installed under her direct supervision. The men joke about them a bit at first, but when the novelty wears off they proceed to forget what they're all about. Seriously though, I never could decide whether the management charges them up to decorations, entertainment or benevolence."

We could not help contrasting this attitude toward safety work with the well-organized plans which, to our knowledge, have been put into effect at some of the larger Eastern refineries. In one, for example, there are six subcommittees corresponding to the various departments—chemical, mechanical, pressure distillation, construction, manufacturing and shipping. Each of these subcommittees makes a periodical inspection of the area for which it is responsible and holds monthly meetings to report on various unsafe practices and to discuss and recommend corrective measures. From each subcommittee there is one representative to the general plant safety committee that handles major problems and acts on the recommendations that cannot be put into effect by the subcommittees.

In another plant safety guards—one for each hundred men—have been appointed, and it is their duty to check up on hazardous and careless practices that might result in loss of life or property. These guards report to their foreman or directly to the plant safety committee.

One refinery that for years has operated several large batteries of pressure stills without a single serious accident attributes the good fortune to a thorough and rather unique system of inspection. In this organization the engineering department is on a co-ordinate basis with production. During every shut-down the stills are inspected and production cannot be resumed until the equipment has been given a clean bill of health by the engineering department. This precaution may result in an unnecessary delay from the point of view of the production man, but the simple fact that it has prevented accidents is adequate justification for it in the eyes of the company officials.

These examples are sufficient to show that some organizations in the petroleum industry have given serious study to safety work and accident prevention. The superficial and deprecating attitude toward these activities is gradually disappearing as management appreciates the fact that its responsibility does not end with a few painted signs or a set of safety rules posted on the bulletin board.

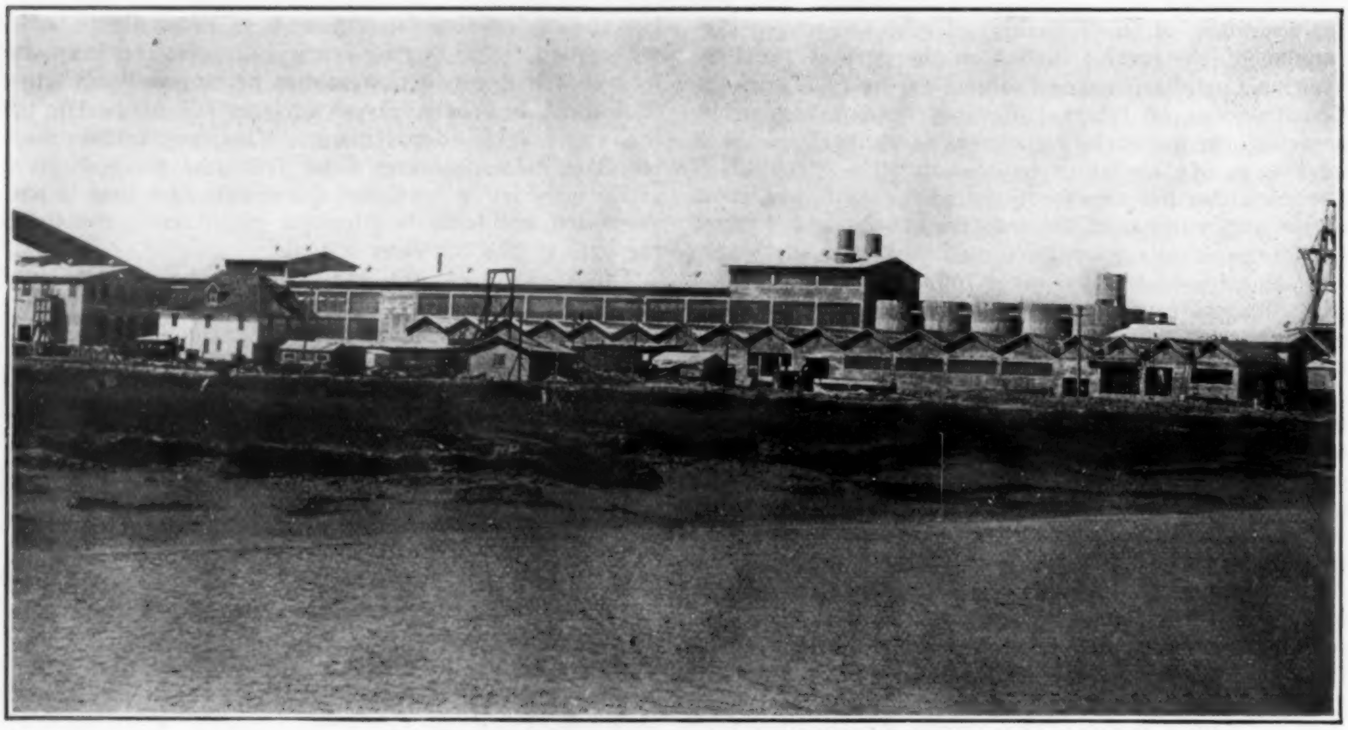
An Indication of Industrial Revival

THERE is no better index of industrial activity than the figures of employment and the actual hours worked in the different industries. More than usual interest attaches, therefore, to the recent report of the National Industrial Conference Board, showing that August witnessed the first break in a 9-months steady decline in hours worked and that September followed with a very substantial gain.

The survey includes 1,700 establishments with 700,000 wage earners in 23 major industries. The full-time or nominal week in these plants averaged 50 hours during the past 9 months, but the average week per wage earner fell steadily during this period until in July it reached 45.1 hours. August a little more than held its own, but September's gain of more than an hour brought the figure to 46.4 hours, or 92.8 per cent of full-time employment. Thus as far as actual hours of work is concerned industry as a whole lost very little working time due to lack of orders, plant breakdown or similar causes.

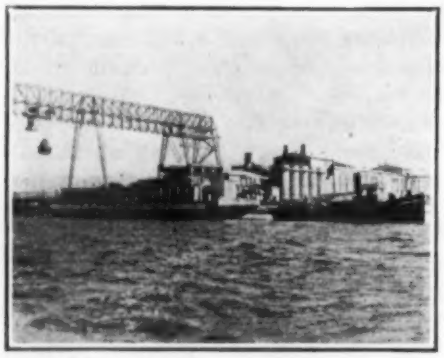
Index numbers show that when September is compared with June, 1920, the hours worked in all industries averaged 70 per cent and employment averaged 72 per cent. It is illuminating to compare these averages with those for some of the industries of the chemical engineering group. On the same June, 1920, basis, employment in August, 1924, in the paper and pulp industry was 82 per cent, meat packing 80, leather 79, fertilizer 74, chemicals 73, paint and varnish 72 and rubber 60 per cent. Thus only the last named fell below the all-industry average of 72 per cent. Hours of work for the same month tell a very similar story for the chemical engineering industries. Compared with an average full-time week of 50 hours and an actual working week of 45.3 hours, we find that the paint and varnish industry, for example, worked 52.4 hours of a nominal week of 53.7 hours. Chemical plants reported 50.5 out of 51.3 hours, fertilizer 49.3 of 55.1 hours, meat packing 49.1 of 49.3 hours, paper and pulp 48.5 of 57.7 hours, leather 44.7 of 50.0 hours, while rubber had an actual week of 44.3, as compared with a nominal week of 47.4 hours.

This cross-section of industry should prove distinctly encouraging when viewed either from the standpoint of industry as a whole or from the more specialized interests of the chemical engineering group. Industrial activity may still be slightly less than a theoretical normal, but the corner has been turned and the trend is strongly upward.



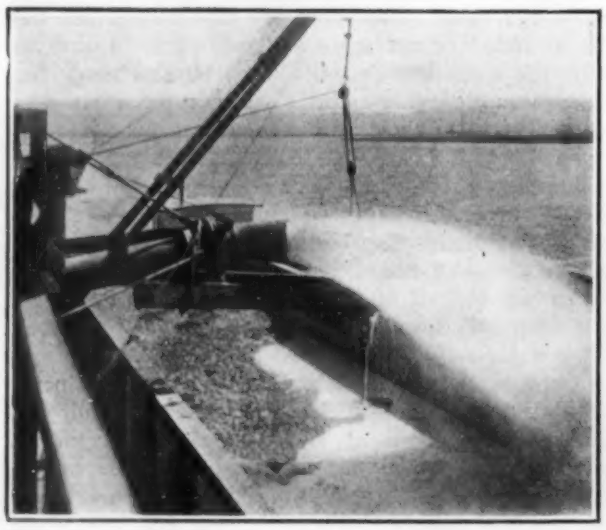
(Above and Right) A plant of the Pacific Portland Cement Co. near Redwood City, Calif., where oyster shells are turned into cement. Note silos for storing finished cement. These have a total capacity of sixty thousand barrels.

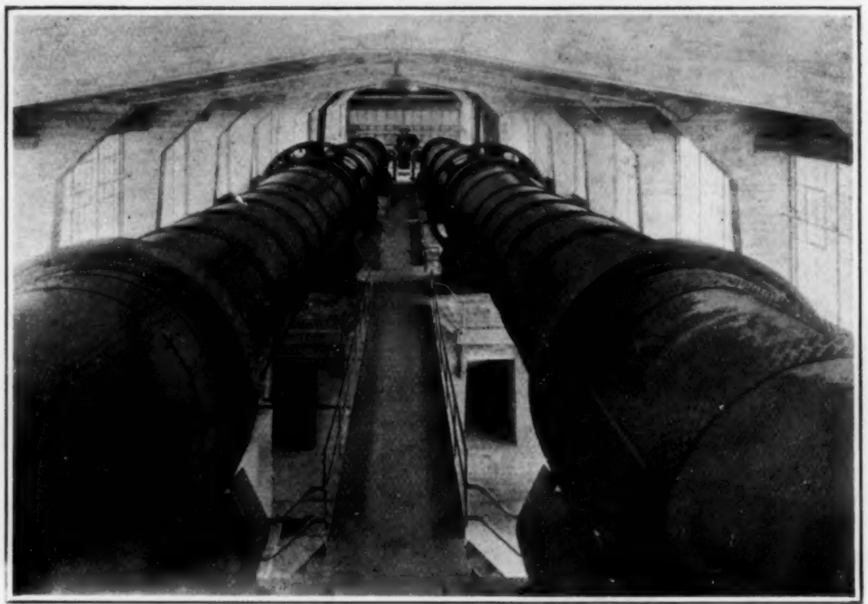
The Small Pictures Below show (right) the suction dredge loading a scow and (left) the gantry crane unloading the scow at the plant. At bottom, the circular bin is simply a concrete shell to prevent the shifting of the mud around the gantry foundations. Left, suction dredge discharging into scow.



Dredging Limestone From the Sea for Cement

It is a rather striking example of ingenious utilization of material. An immense bed of oyster shells in South San Francisco Bay is being sucked up into barges. The mixture thus obtained contains limestone and clay in the proportions needed for cement.





Cement From Oyster Shells

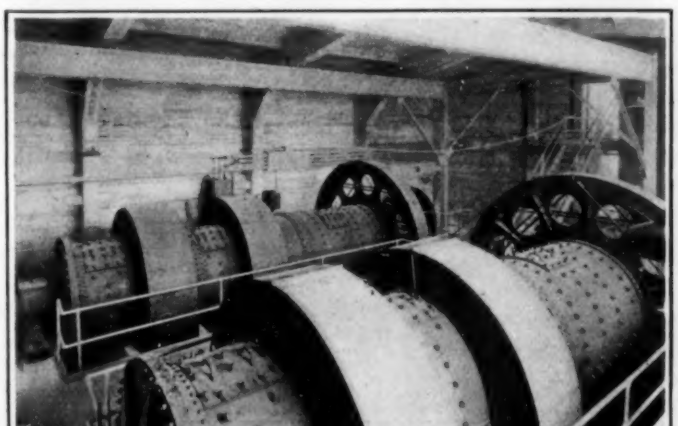
Some Significant Details of a Large Wet Process Plant Near San Francisco That Is of Unusual Interest to Engineers

THE pictures on the opposite page tell the story of gathering the raw material for this process. The plant itself, built on more than 4,000 piles driven from 80 to 85 ft. into the sediment, is of concrete throughout, with special inverted-U reinforced concrete arch type of building, with concrete roof and glass side walls. Provision is made for an increase of capacity as occasion arises by the duplication of some of the existing equipment. The present capacity of the plant is about 3,000 bbl. per day.

The wet process is used. From the steel storage bin the shells, with some associated clay, pass by screw conveyor to two three-compartment cylindrical mills, using 4-, 2- and ⅞-in. steel balls, sufficient water being added to insure a slurry moisture content of about 35 to 40 per cent. The discharge from the mills is pumped to one of fifteen concrete storage vats, where it is kept in agitation with compressed air and from which it is drawn for delivery to two revolving kilns, each 235 x 10 ft.

These immense units were first assembled on the concrete pier foundations provided, the special earthquake-proof concrete structure being afterward added above and around them. Each kiln revolves once in 90 seconds. The kilns are oil fired, the daily consumption of fuel in each amounting to about 300 bbl. The discharged clinker passes to cylindrical, revolving coolers, the heated air resulting being used to burn the oil burned in the kilns and to provide adequate oxygen for combustion. The cooled clinker, to which a small amount of gypsum is added, passes through two two-compartment ball mills, similar in size to the wet mills already pictured, and operated in conjunction with air classification equipment.

The final product is conveyed to and stored in concrete bins, with a total capacity of 60,000 bbl., from which it goes to packing machines equipped with dust-collecting equipment. The sacked cement is conveyed by belt to freight cars or by underground tunnel to the holds of barges or other vessels at the dock alongside.



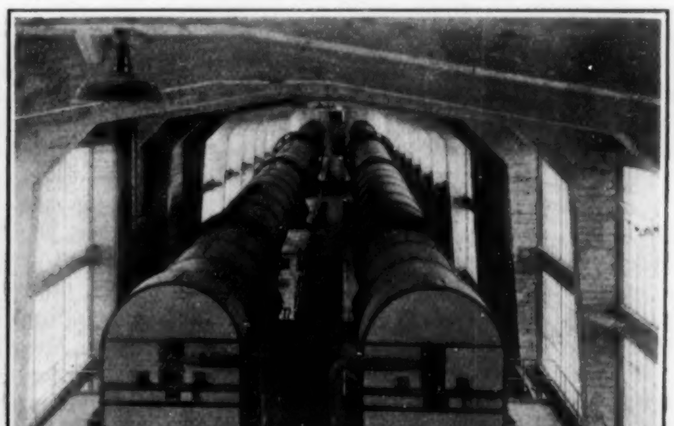


Fig. 1—A Shale-Oil Refinery in the Making
Plant site of the Monarch Shale Oil Co. near DeBeque, Colo., overlooking Conn Creek. The re-run still and the storage tanks for refined products are to be seen in this picture.

Persistent Pioneering in Shale-Oil Production

Ginet's Plant at DeBeque, Colo., Is Beginning to Show Results After Five Years of Patient Experiment

By S. D. Kirkpatrick
Assistant Editor, *Chem. & Met.*

PERHAPS the most creditable—and certainly the most persistent—attempt to produce shale oil on a commercial basis in the DeBeque, Colo., district, is to be found in the plant of the Monarch Shale Oil Co. Behind this organization is a most energetic and enthusiastic worker, J. H. Ginet. Although not himself a technologist and often severely handicapped because of the lack of financial support, this investigator has spent more than 5 years in a consistent effort toward oil-shale development. The results obtained may not be as impressive—perhaps not as practical—as those of others in the field, but there can be no doubt that the persistent work so sincerely prosecuted is in the direction of progress.

The property of the Monarch company is on Conn Creek about 13 miles north of DeBeque. The ore is mined from an 8-ft. seam of the rich "mahogany" oil shale, a tunnel having been driven about 75 ft. in from the outcrop. The shale is crushed at the mine entrance, where a small Sturtevant gyratory crusher serves satisfactorily to reduce the run-of-mine shale to ½ to ¼-in. mesh, which is the size best suited for the Ginet type of retort. To convey the crushed shale to the retorting plant, a thousand feet below the crusher, the Monarch plant employs the simple and novel method of dropping it through a 4-in. galvanized iron pipe. Clogging of this pipe is avoided by carefully controlling the feed.

From the crushed shale bin the material is carried by a screw conveyor through a preheater for removing its moisture and is then charged automatically into the retort. This consists of a ⅝-in. cast-iron cylinder 3 ft. in diameter and approximately 20 ft. in length. The retort is made in ten sections set horizontally in a brick furnace adapted for either oil or gas heating. Inside of the cylinder is an 8-in. pipe shaft, to which are attached twenty arms carrying 12-in. scoops. As these revolve at about 8 r.p.m. they agitate the shale by lifting it to the top of the retort and showering it down through the heated gases. At the same time the agitating equipment carries the shale forward in such a way that approximately 12 minutes is required for one throughput. The vapors are taken off through a number of openings at the top of the retort. It was originally planned to obtain several well-defined oil fractions from these, but the scheme has since been abandoned and now the vapors from the separate outlets are combined before passing to the crude oil condensers.

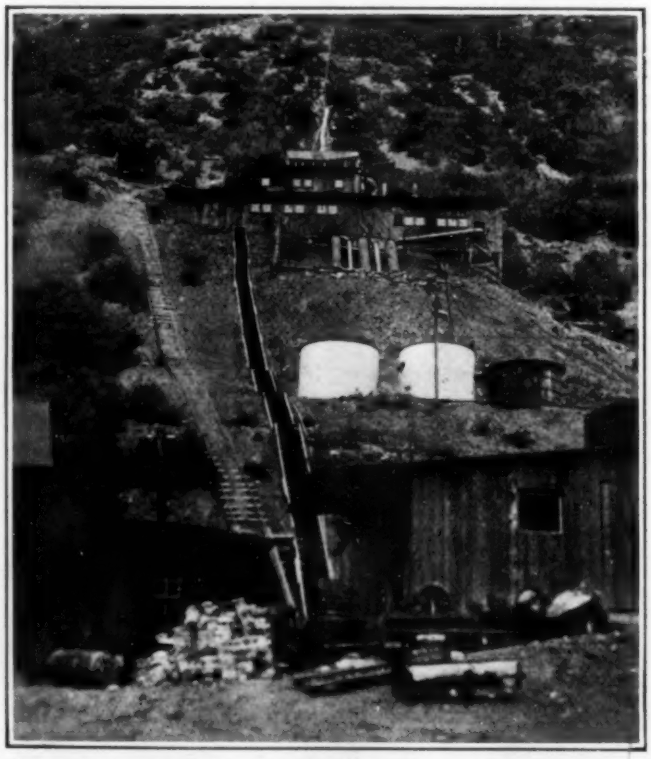


Fig. 2—An Oil-Shale Retorting Plant on a Sloping Hillside
Directly above the upper building that houses the retort may be seen the iron pipe through which the crushed shale is dropped down from the crushing plant at the mine entrance a thousand feet above the retort.

Fig. 3—A Close-Up View of the Monarch Plant

Since this photograph was taken the condensing equipment in the foreground has been considerably modified. Under the present arrangement the condensers are inclined along the surface of the hillside.

At the start of operations the retort is first heated by oil burners, but after distillation is under way sufficient incondensible gas is produced to heat the furnace and also to furnish power for the agitating equipment. Furnace temperatures, recorded by three Brown pyrometers in the retort setting, are controlled to give a gradually increasing heat toward the discharge end of the retort. The temperatures within the retort average approximately 770 deg. F., while a pyrometer at the final outlet for the vapors shows about 850 deg. F.

Several means have been tried to provide for a gastight seal through which to discharge the spent shale. At present the shale drops into an iron box with a sliding top and bottom. When this pocket is filled, the top slides into place while the bottom opens and permits the spent shale to fall into a conveyor that carries it to the dump.

The Ginet retort has a rated capacity of 65 tons of shale per 24 hours. Judging from the quantity of spent shale on the dump, the writer would estimate that not more than 300 tons of oil-shale has been distilled in the plant since it was erected in 1920.

Refining Procedure

The vapors from the retort pass through four condensers, three cooled by air and one by water. The crude shale oil is allowed to settle in order to trap the water before it flows by gravity to the storage tanks. The refining equipment at the Monarch plant is extremely crude and its operation is as yet in a frankly experimental status. A 90-bbl. oil-fired still serves to run down the crude shale oil as well as to re-run the distillate.

The gasoline fraction from the latter distillation is treated with sulphuric acid and is then washed with a caustic soda solution in an improvised, continuous treater built up of a series of 5-gal. stoneware jars. Final filtering through the kieselguhr known as "triolite" serves to remove the color and yield a marketable gasoline. The company also intends to market a flotation oil. Sales of this product for experimental purposes have indicated an attractive market among metal-mining companies in the West and far West.

Hydrofluoric Acid for Removing Enamel

Hydrofluoric acid has been used very successfully for removing vitreous enamels from sheet steel, thus making re-use of the steel base possible. Data are given by H. C. W. Mehling, of the American Radiator Co., in the November, 1924, issue of *The Enamelist*, p. 8.

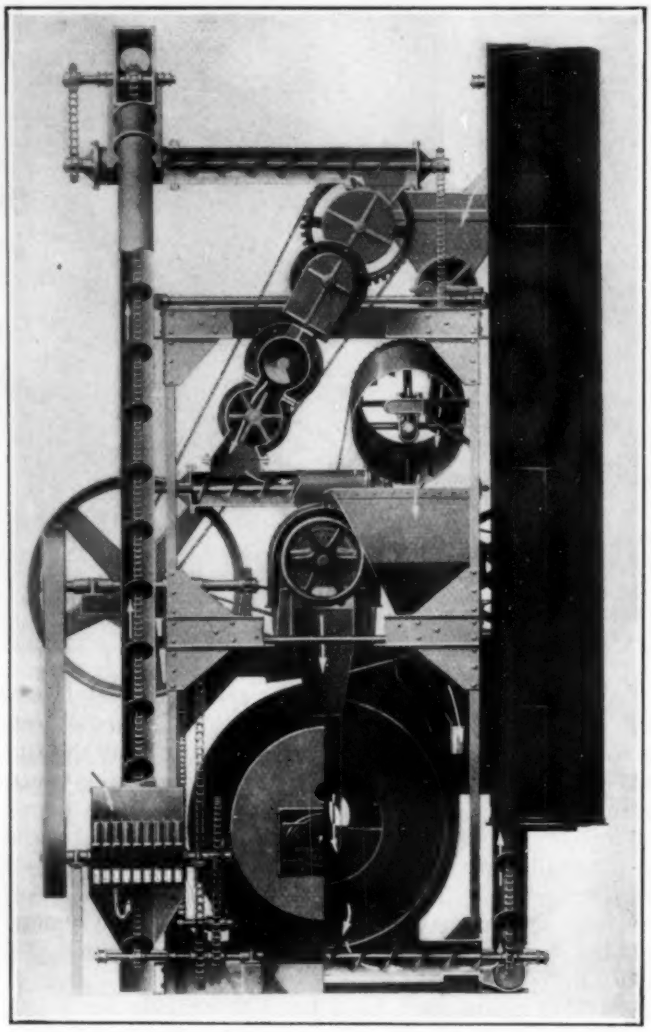
Faced with the problem of salvaging 150,000 sq.ft. of jackets that could not be used because of a change in pattern, Mr. Mehling tried a solution containing: hydrofluoric acid, 600 lb.; hydrochloric acid, 25 lb.; water 2,500 lb. This is used at 160 to 180 deg. F. and strips the enamel in from 1 to 2 hours. The life of the solution is 36 to 40 hours, but during that time 3,000 to 4,000 sq.ft. may be treated. The cost, including chemicals, labor and overhead, was found to average about 4c. per sq. ft. No extra labor was required, as the men who did the pickling were able to handle this as well.

French Pulp Imports Increase

France is largely dependent upon outside sources for its paper and paper supplies in the raw or semi-manufactured state. Imports during the first 9 months of the present year were as follows: Dry mechanical pulp, 26,560 metric tons; moist mechanical pulp, 50 per cent water, 98,380 metric tons. These figures are practically the same as those of imports during the same period in 1923. The value of the total importation for 1924 was 56,134,000 francs. Chemical pulp in 1924, for the same period, reached 157,874 tons, with a value of 197,837,000 francs, against 146,629 tons, valued at 170,591,000 francs, the year previous.

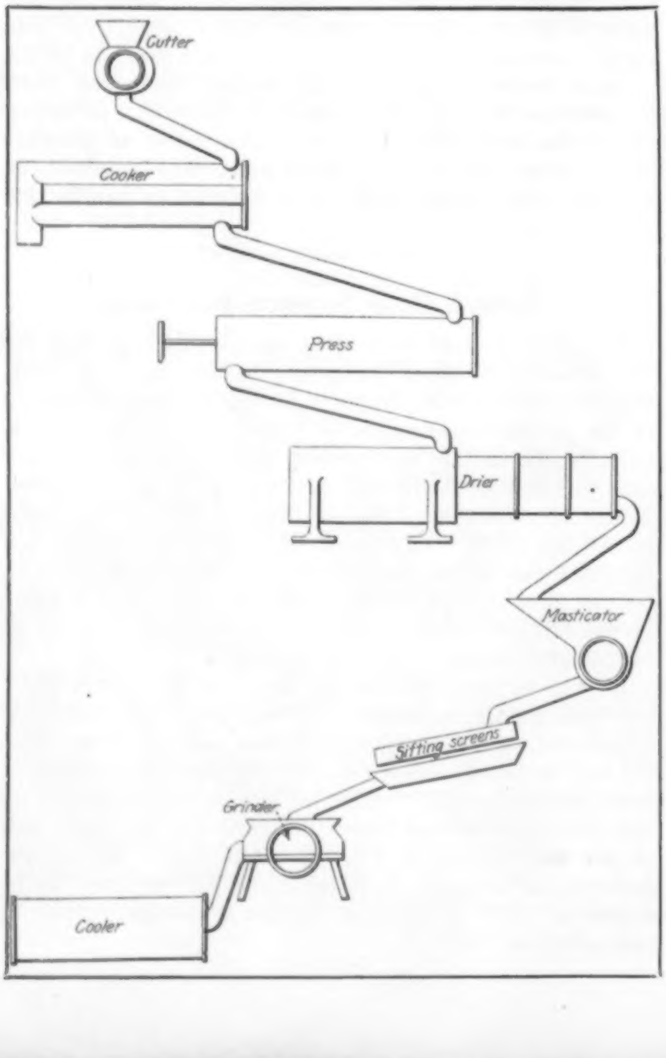
It is to be remarked in the latter instance that while the tonnage has increased, the valuation has fallen off in proportion. This apparently has had but little effect on the price of newsprint or the cheaper grades of book paper, as the complaint in those industries is that the high cost of paper accounts for the high cost of printed matter in France. The Paris dailies announced an increase in price from 15 centimes to 20 centimes (3 to 4 cents at normal exchange rates) to take place on Nov. 15.

This skeleton drawing is not easy to understand unless you know the starting point. If the fish is put in at the lower left hand corner, the other units follow along all right and get all that is promised in the flowsheet below.



Edible Fish Flour

A Compact Unit for Producing a Nutritive Flour From Raw Fish



THE Hiller unit and process for the manufacture of edible fish flour are shown in the two illustrations. The fish are first cleaned, then fed to a cutter of the meat-grinder type. From here the mass is conveyed to a cooker, operating under pressure, in which the oil cells are broken down, thence to a press for the removal of oil and water. The press cake goes to a drier, direct heat being used, thence to a masticator, in which the dry flesh is separated from the bone. Screening follows, the sifted material passing to a grinder and thence to a cooler.

A feature of the process is the continuity of operation possible, and the conservation of heat by closed connections between the various machines comprising the unit, thus facilitating the expression of oil and the subsequent operations of mastication, screening and grinding. Intermittent operation of any or all of the machines in the unit is practicable, if quantity being treated is small. The fish oil recovered as a byproduct is salable as such, or may be purified and deodorized for uses for which any of the standard edible oils are available. The process, designed by Stanley Hiller of Oakland, Calif., is in successful operation at the plant of the Bayside Fish Flour Co., Monterey, Calif., and other installations are planned.

Blue Water Gas Offers Industrial Fuel Economies

Small Furnaces Operating at High Temperatures and Processes Like Welding, Where High Temperatures Must Be Obtained Without Regeneration, Are the Special Field of This Valuable Fuel

By D. J. Demorest
Professor of Metallurgy, Ohio State University

> In an article in *Chem. & Met.* for Oct. 13, 1924, Professor Demorest described the industrial utility of producer gas, the most important manufactured gaseous fuel of industry. In the accompanying article the same author discusses the economy of blue water gas, a fuel of more limited application, but one of almost as much importance to industry. From the facts given in these two articles, criteria may be set up to enable the industrialist to make a satisfactory choice between these fuels in his own plant, for the relative costs, relative advantages and most favored applications of each of these gases are here plainly set forth.

BLUE water gas, in contradistinction to water gas made for domestic use, which is carburetted water gas, is water gas that burns with a blue flame, having no illuminants added to give a bright flame. The process of manufacture is similar to that of producer gas, except that the air and steam are passed through the bed of hot coke alternately instead of simultaneously, and the products are kept separate, the gas made on the steam runs being the water gas.

However, the blue gas cannot be made satisfactorily in a producer, for the generator in this case must have a tight bottom instead of the open water seal of the producer. The apparatus is called a water gas "generator." Owing to the nature of its operation, it must withstand a much higher and a rapidly fluctuating temperature as compared with the gas producer. For this reason the choice of a satisfactory refractory for the generator is much more difficult. The chief reaction of blue gas generation is strongly endothermic—that is, $C + H_2O = CO + H_2 - 52{,}000$ B.t.u. per pound molecular weight. In addition, about 21 lb. of steam passes through unused per 12 lb. of carbon consumed. The reaction requires a temperature above 1,800 deg. F. If the temperature falls much below 1,500 deg. F., the reaction $C + 2H_2O = 2H_2 + CO_2$ prevails, resulting in a poor gas and a waste of steam and coke.

The gas leaves the generator at about 1,300 to 1,400 deg. F., carrying out 17,800 B.t.u. additional. Also the unused steam carries out 11,000 B.t.u. So for each 12 lb. of carbon gasified by the above reaction at 60 deg. F. and 30 in. mercury there results 760 cu.ft. of gas and 81,600 B.t.u. are consumed, assuming that no other reaction occurs.

This absorption of heat would soon cool the generator to such an extent that the reactions must cease. It is therefore necessary to interrupt the generation every few minutes to reheat the generator. For this purpose a strong blast of air is blown through, burning the carbon by two reactions:

$$2C + O_2 + 3.8N_2 = 2CO + 3.8N_2 + 106{,}000 \text{ B.t.u.} \quad \text{(not desired)}$$

$$C + O_2 + 3.8N_2 = CO_2 + 3.8N_2 + 174{,}500 \text{ B.t.u.}$$

These gaseous products also leave the generator hot carrying out 47,400 B.t.u. and leaving 127,100 B.t.u. to heat the coke and generator. Some of the coke is, however, burned according to the first reaction and some of the heat is lost by radiation, so that in practice it takes about as much coke to heat the generator during air blasting as is gasified by the steam during the water-gas making.

In practice it is found that the blue gas has the average composition: CO_2, 5 per cent; CO, 42 per cent; H_2, 47 per cent; CH_4, 1 per cent; N_2, 5 per cent; and the heat content is 300 B.t.u. per cu.ft. gross. Also 1 ton of good coke containing 10 per cent ash will generate 55,000 cu.ft. of gas. Taking the B.t.u. value of the coke at 13,140 B.t.u. per pound, this gives a generator efficiency of 62.5 per cent. Since the hot gases leaving the generator pass through waste heat boilers and generate enough steam to operate the process, no deductions need be made for the heat required to operate the generator.

Before passing into the waste heat boilers the blast gases are mixed with the proper amount of air in an igniter to burn any CO contained. This produces additional heat for the steam raising.

In the past coke and anthracite coal have been the only fuels used in blue-gas generation, but recently bituminous coal has been employed for this process with some success. Anthracite or coke as fuel has the advantage of producing no tar or soot, thus making it possible to pipe the gas any distance without danger of clogging the mains, also eliminating expense for cleaning the gas. The chief requirement for a hard fuel is that the ash be fused with difficulty. The reactions of the process require high temperatures during the air blast part of the cycle and hence the generator and the fuel are made hot enough to cause clinkering of the ash and fusion against the refractories of the generator wall. Since the generators must be stopped

and the ash cleaned out by manual labor every 8 hours, the labor and delay caused by ash clinkering and fusing against the walls are matters of concern. The perfection of a mechanically cleaned ash pit for the generators is greatly needed.

Bituminous coal as a raw material for this process seems to offer promise of much success at such times as the cost of hard fuel is at a much higher level. It offers operating difficulties because of the tar evolved, the difficulty of keeping the fuel bed in good condition, the blowing of the coal out of the generator and the lower efficiency of the waste-heat boilers. However, when the price relation between this fuel and coke or anthracite is right, the lower cost of the bituminous coal may more than make up for the increased cost of operation and result in the wider use of this coal for blue-gas manufacture. At present, however, this use of bituminous coal is hardly out of the experimental stage.

Several properties of blue water gas make it a particularly useful industrial fuel. First, it is clean, free from tar, soot and vapors. This makes it possible to transmit the gas at high pressure without fear of clogging deposits and hence relatively small mains can carry a large number of B.t.u. per hour. This is important, since the high-pressure transmission of gas is making it possible to supply communities and industries with gas that would otherwise be without it, just as high-tension transmission of electric power is performing a similar service with that necessity. Also, the high pressures of transmission combined with the fact that it takes only a little more than 2 cu.ft. of air for the proper combustion of each cubic foot of the gas makes it possible to use the energy of the gas flow to get a proper air-gas mixture without employing mechanical blowers.

Again, it is impossible to produce smoke or deposit soot when firing with blue gas. This makes it of the highest value for welding and similar work where absolute cleanliness is a desideratum.

And finally, because of the high flame temperature of blue gas, it has a high efficiency of use. As explained in the previous paper on producer gas, the theoretical maximum temperature of combustion or flame temperature of any gas is that at which the sensible heat of the products of combustion is equal to the heat of combustion of the gas, counting as products of combustion not only the CO_2 and H_2O produced by the oxidation of the gas but also the nitrogen introduced by the air and the excess air. The simplest way to calculate the theoretical maximum temperature of combustion is to plot a curve of temperature against the sensible heat in the products of combustion. These calculations are never correct, because of the unknown loss of heat by radiation and dissociation.

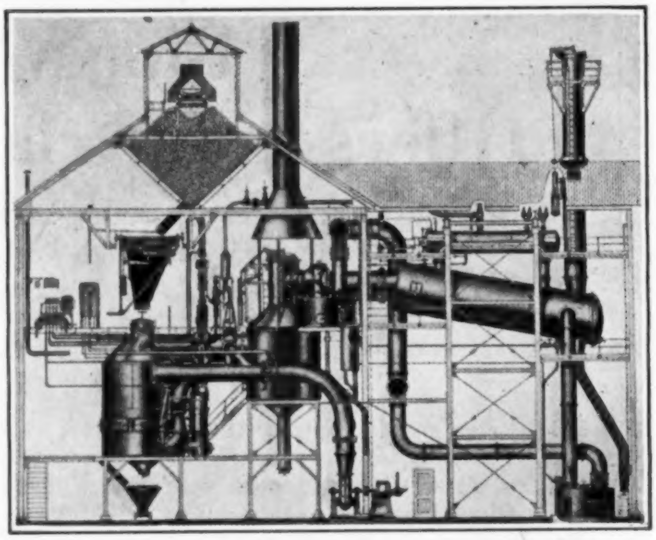


Fig. 1—Blue Water-Gas Apparatus With Waste-Heat Boiler

Modern blue water-gas generators are automatic in operation as far as the air-steam cycles are concerned, the automatic timing of the valves to give proper timing of steam blast, both up and down, and air blast being exceedingly dependable. This has made the blue water-gas generator the efficient and reliable apparatus that it is. In this illustration the waste-heat boiler and the control mechanism for the valves will be noticed.

However, based on the same considerations, more accurately calculable and of more importance is flame efficiency. In the curves given in Fig. 3 are shown the flame or thermal efficiencies of cold, clean producer gas; blue water gas; and coal gas and natural gas used cold and used with regeneration or recuperation at a temperature of 700 deg. C., or 1,292 deg. F. This temperature was selected because it is about the highest temperature at which recuperation can be carried out using metallic recuperators. In the case of natural gas the air only is preheated, while for the other gases both air and gas are preheated. The combustible gases are considered as being saturated with water at 60

Fig. 2—Water-Gas Plant During Erection

While this plant is for the making of carburetted water gas, it is essentially the same as a plant for blue water gas except for the addition of the carburetter, which is the central one of the three vertical shells in the unfinished structure. The end of the inclined waste-heat boiler can be seen projecting from the structure at the left of the water-gas set. This is a plant for city gas supply, erected in a town that formerly had natural gas.

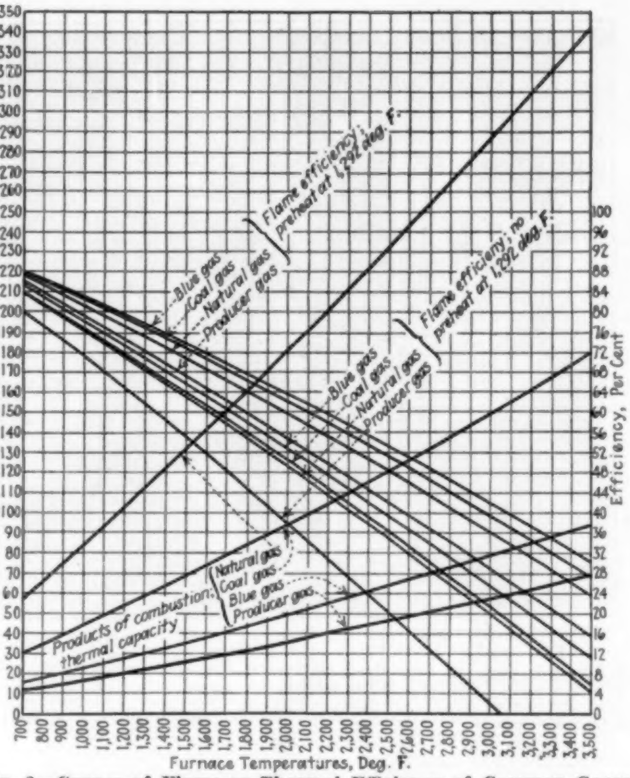


Fig. 3—Curves of Flame or Thermal Efficiency of Common Gases

These curves, calculated from the data in the accompanying table, are for usual industrial furnace conditions using both air and gas recuperation with the familiar metallic type of recuperator at a temperature of 700 deg. C., about the highest that may be used with this type of equipment. The difference between the heat of combustion of the gases and the sensible heat of the waste flue gases neglecting the furnaces losses such as radiation is the basis of the curves.

deg. F. and 30 in. of mercury and the air as 50 per cent saturated. The table shows in considerable detail the data and calculations used to obtain the curves of Fig. 3.

When a furnace is heated by a burning gas the gaseous products of combustion must, of course, leave the furnace at a temperature not lower than the temperature of the furnace and the useful heat so far as the operations of the furnace are concerned is the difference between the heat of combustion of the gas and the sensible heat of the hot products of combustion leaving the furnace. In this way the curves of flame or thermal efficiencies have been calculated and constructed. Of course, of the heat which is given to the furnace some is wasted by radiation from the furnace walls, etc., but this amount can be neglected at this time.

Inspection of the table reveals a number of interesting things. A large proportion of the heat in the products of combustion is found in the nitrogen from the air used and in the excess air, and, should the amount of excess air used be too great due to poor operation of the gas burners, the heat carried out of the furnace is greater and the flame efficiency is lower. In calculating the table, excess air of 10 per cent was used, which is about the minimum compatible with complete combustion in an industrial furnace. The B.t.u. values of the gases are the net or low B.t.u. values. The gross B.t.u. values usually given for the gases are misleading, for they include the heat obtained by condensation of the water produced by combustion of hydrogen-bearing fuels, and this heat of condensation cannot be obtained under any industrial furnace conditions. The last column of the table contains the number of B.t.u. of sensible heat in each cubic foot of the products of combustion. It will be noticed that this figure for blue water gas is higher than for any of the other gases. Hence the flame temperature and the flame efficiency of water gas are higher than are these figures for any of the other gases. This fact, together with cleanliness and comparative cheapness, gives this fuel its special usefulness. The curves show how greatly recuperation or preheating of the air and gas to even so low a temperature as 1,300 deg. F. raises the flame efficiency, and if preheating is done in regenerators to such high temperatures as are obtained in regenerative open-hearth furnaces or coke ovens, the flame efficiencies are correspondingly increased. These curves are reasonably accurate for medium temperatures, but at extremely high temperatures the dissocia-

			Products of Combustion					
			Per Cent					
	Constituent	Orig. Comp. Per Cent	CO_2	H_2O	N_3	Air Excess	Total Thermal Capacity	B.t.u. per cu.ft. of Prod.
Producer Gas	CO_2	5.0	5.0					
	C_2H_4	0.6	1.2	1.2	6.8			
	CO	25.0	25.0		47.5			
	H_2	12.0		12.0	22.8			
	CH_4	3.0	3.0	6.0	22.8			
	N_2	52.7			52.7			
	H_2O	1.7		2.9				
	Total.....	100.0	37.2	22.1	152.6	12.6		67.5
	Net B.t.u. 151 per cu.ft. = 58300 per pound molecular volume							
	Therm. Cap. at 752°F		2660	1345	8300		12305	
	1292		5000	2400	14800		22200	
	1832		7500	3530	21650		32680	
	2372		10200	4800	28700		43700	
	2732		12000	5730	33570		51300	
	3272		14800	7330	41100		63230	
Blue Water Gas	CO_2	4.0	4.0					
	CO	42.0	42.0		79.8			
	H_2	46.5		46.5	88.4			
	CH_4	1.0	1.0	2.0	7.6			
	N_2	4.8			4.8			
	H_2O	1.7		3.8				
	Total.....	100.0	47.0	52.3	180.6	22.2		90.0
	Net B.t.u. 273 per cu.ft. = 105200 per pound molecular volume							
	Therm. Cap. at 752°F		3360	3180	10250		16790	
	1292		6300	5650	18300		30250	
	1832		9500	8330	26600		44430	
	2372		12870	11330	36500		60670	
	2732		15200	13600	41200		70000	
	3272		18700	17300	50400		86400	
Coal Gas	CO_2	2.0	2.0					
	C_2H_4	3.5	7.0	7.0	39.9			
	CO	7.5	7.5		14.2			
	H_2	50.0		50.0	95.0			
	CH_4	28.0	28.0	56.0	212.8			
	C_2H_6	1.3	2.6	3.9	12.3			
	N_2	6.0			6.0			
	H_2O	1.7		4.3				
	Total.....	100.0	47.1	121.2	380.2	47.3		83.0
	Net B.t.u. 493 per cu.ft. = 190300 per pound molecular volume							
	Therm. Cap. at 752°F		3360	7360	21500		32220	
	1292		6300	13100	38400		57800	
	1832		9500	19300	56000		84800	
	2372		12900	26300	74300		113500	
	2732		15200	31400	87000		133600	
	3272		18700	40300	106200		165200	
Natural Gas	CH_4	84.0	84.0	168.0	638.0			
	C_2H_6	10.0	20.0	30.0	95.0			
	N_2	4.3			4.3			
	H_2O	1.7		6.8				
	Total.....	100.0	104.0	204.8	737.3	92.5		81.0
	Net B.t.u. 926 per cu.ft. = 357000 per pound molecular volume							
	Therm. Cap. at 752°F		7450	12450	41700		61600	
	1292		13900	22200	74500		110600	
	1832		21000	32700	108500		162200	
	2372		28500	44500	144000		217000	
	2732		33600	53200	168000		254800	
	3272		40500	68000	206100		314600	

This table shows in considerable detail the data and calculations used to obtain the curves in Fig. 3. The thermal capacities of the products of combustion are taken from the thermal capacity table on page 452 of "Metallurgical Analysis" by Lord and Demorest, which was compiled with extreme care by the late Prof. E. E. Somermeier, of the department of metallurgy of Ohio State University. The calculations are carried out on the pound molecular volume basis, which is by far the most convenient way of making gas calculations. To obtain the figures for thermal capacities of the products of combustion on this basis it is only necessary to multiply the figures given in the book on the gram molecular volume basis by 1.8. It should be noticed that thermal capacity is not heat value, but ability to carry sensible heat.

tion of the products of combustion render them less accurate in absolute figures, though they are accurate enough relatively. One other characteristic should be noted—rate of combustion. Hydrogen and carbon monoxide have very high rates of combustion compared with the hydrocarbons, and hence blue gas, which is almost entirely made of these constituents, burns with great velocity, making it possible to liberate a large amount of heat in a small volume and hence giving a high actual flame temperature and efficiency. For this reason the actual efficiency curve of blue gas is better than the theoretical curve shows.

A recent extensive test by Mr. Morris at the coke-oven plant of the Seaboard By-Product Coke Co., using both producer gas and blue water gas for heating the coke ovens, indicated that the manufacturing cost of blue water gas is about 40 per cent greater in cents per million B.t.u. than that of producer gas, while both are absolutely satisfactory for heating coke ovens. This figure is based on the same price for generator fuel as for producer fuel. This is not correct, however, for generator fuel is more costly than producer fuel. For this reason in large-scale operations like steel plants and coke plants, where regenerators can be used to raise the flame temperature and efficiency of producer gas to the high temperatures required for these operations, producer gas is the economical and logical fuel to use. This refers to hot, raw producer gas.

On the other hand, where a large number of small heating operations are required in the same plant or in neighboring plants where a central gas generator can be installed and the gas piped under pressure to the various points of application, then blue water gas is a logical competitor of producer gas. This is particularly so where the heating operations require high temperatures, as for instance in welding.

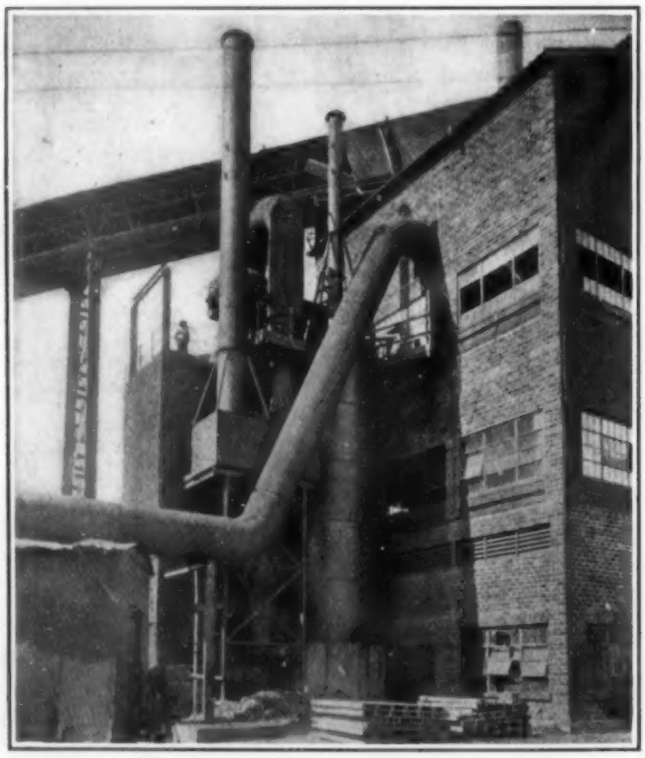


Fig. 4—Dust and Smoke Scrubbing Equipment at Outlet of Waste-Heat Boilers

The modern plant in a large city finds it necessary to remove the dust and soot from the waste blast gases of the gas plant, and the view above shows the type of equipment that is installed in connection with the waste-heat boilers of a blue-gas plant for this purpose.

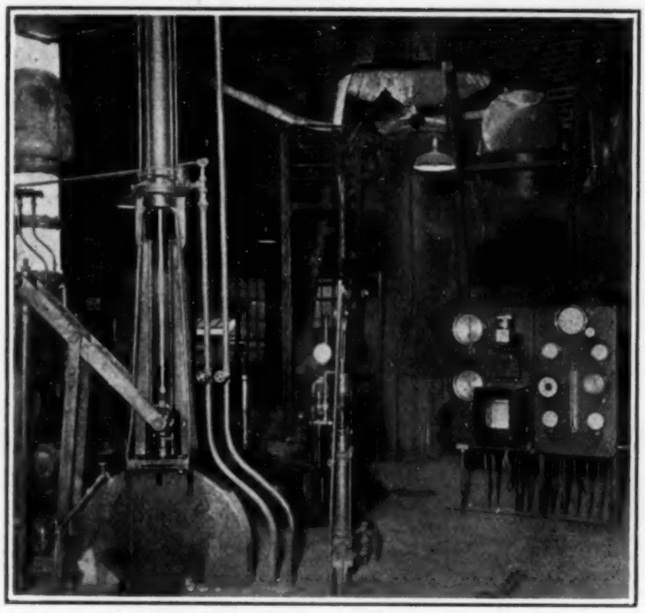


Fig. 5—Operating Floor of a Modern Water-Gas Plant

Water-gas sets as now designed are automatic in operation, and the operator from the floor where his gage board is located has full oversight of the various steps of the process. The instruments shown on this gage board indicate the close control that is maintained throughout water-gas manufacture.

When a suitable and cheap enriching agent is obtainable, blue water gas stands pre-eminent among manufactured gases for city gas supply. For instance, for those regions that have had natural gas but whose gas supply is now failing, the logical procedure is to install blue gas plants and use enough natural gas to enrich the water gas up to from 450 to 550 B.t.u. per cubic foot. It costs about one-half as much to install a blue-gas plant as to install a coal-gas plant of like capacity. Hence, as long as there is a supply of natural gas for enriching purposes, it is appropriate to use blue gas unless the price of coke is outrageously high. As natural gas becomes insufficient for enriching blue gas, then it becomes necessary to build a coal-gas plant to supplement the supply, if the capital for such an operation is available. If not, enrichment with oil is necessary, but such carburetted water gas is expensive.

As stated above, blue gas is about 40 per cent more costly than producer gas, and other sources of information would indicate that when working on a fairly large scale and with coke costing about the same per ton as coal, a condition that would obtain only in coke plants or coal-gas plants having a supply of otherwise unsalable coke, blue water gas can be made for an over-all cost of $0.17 per thousand cubic feet. But if the cost of coke is taken at the price at which it is ordinarily sold, say $10 per ton, then the cost of the blue gas is about $0.27 per thousand cubic feet. All of these cost figures are based on the assumption that the plant operates fully throughout the year. Obviously, if the plant is operating only part of the time, the interest and depreciation charges per thousand cubic feet will be greater and the cost per thousand cubic feet will be correspondingly greater. The labor cost in manufacturing blue water gas is about three times that entailed in making hot, raw producer gas. It would probably be safe to say that a manufacturer making his own blue gas on a large scale in a region where cost of coke is not increased by long freight hauls could probably get this fuel at an over-all cost of $0.25 per thousand cubic feet.

What the Potash Pact Means to American Industries

As Largest Consumers We Must Support a Large, Inefficient Fraction of the German Industry—If High-Cost Producers Were Eliminated, Substantial Price Reduction Would Be Possible Almost Immediately

ON AUGUST 14 last, representatives of the German "Kalisyndikat" (Potash Syndicate) and the French "Société Commerciale des Potasses d'Alsace" met at Basel, Switzerland, and agreed to partition the United States market for potash so that Germany acquired a share of 62½ per cent of deliveries and France (Alsace) the remaining 37½ per cent. The agreement on the United States market lasts for 3 years, and became retroactively effective from May 1, 1924—that is, the beginning of the so-called "fertilizer year." Thus the pre-war potash monopoly is restored, so far as America is concerned, and negotiations for the similar division of other markets have been proposed. In this restoration careful students of the German industry see a well-laid plan for mulcting the foreign consumers of potash salts. The agreement perpetuates for 3 years the production allocation and price fixing of the Federal Potash Council (Reichs-Kalirat) with its uneconomic policy of shielding the inefficient home producer at the expense of American and other foreign consumers.

This body is *de facto* the dictator of the German potash industry and its prices are fixed with reference to the production costs and profits of the least efficient small producers. It is true, of course, that the margin of profit on sales by the more efficient concerns is higher because of mass production, higher concentrations in KCl of raw salts and greater byproduct possibilities, as for instance, of bitter salts (epsom salts), glauber salts, magnesium chloride and bromine. After operating costs of the Potash Syndicate are deducted, the efficient producer is paid for his allotted orders on the same basis as the inefficient, but his production is, of course, limited. The larger groups would like to operate to capacity, reduce costs, cut prices, and enjoy a free competition that would force the smaller, high-cost competitor to close down. Representatives of the "Wintershall" group, which controls about 40 per cent of all German potash production, are reported to have said that given free competition they could supply the entire American market at at least 35 per cent below current prices.

> With free competition the leading German producers believe they would be able permanently to undersell their Alsatian competitors and reduce the price of muriate immediately by 35 per cent. The Franco-German pact prevents them from doing this and continues for 3 years the uneconomic protection of the inefficient, high-cost producer. In the meantime the American potash-consuming industries will continue to pay the bill.

Despite the potash monopoly, concentration of production has notably increased since the war, along with the closing of small enterprises, the latter's production quotas being acquired by the larger producers which purchased them. At present two concerns have acquired approximately 60 per cent of German production: the "Wintershall-Aktiengesellschaft deutsche Kaliwerke-Glueckaufsondershausen-Ronnenberg" merger controls roughly 40 per cent of production, and the "Salzdetfurth-Westeregeln-Aschersleben" merger about 20 per cent.

Other German production is divided, under present quota allotment, among the following producing enterprises, in the order of their importance: Burbach, 9 per cent; Gumpel Group, 7 per cent; Preussische Fiskus, 6 per cent; Neustassfurt Group, 4 per cent; Einigkeit Group, 3 per cent; Mansfeld Works, Wilhelm Sauer Group, Deutsche Solvay Group and Anhaltische Fiskus, each close to 2 per cent; Adler Works, 1 per cent; Roechling Group, 0.6 per cent; Rothenfelde, 0.1 per cent. This totals 38.7 per cent, while special plants produce the other 1.3 per cent, making a total of the remaining 40 per cent not controlled by the "Wintershall" combine and "Salzdetfurth" respectively.

"Wintershall" is now erecting a works at Merkers, south of Eisenach (specializing on byproduct industrial salts), which promises to be the largest potash works in the world, built on the mass-production plan. This and associated "Wintershall" concerns, such as the "Wintershall" works at Heringen, the "Alexandershall," the "Heiligenroda" the "Sachsen-Weimar" the "Neubleichroda" and the "Bernteroda" mines, calculate that they can absorb much larger production, at cheaper costs, if allowed to do so.

While the Franco-German potash agreement will most likely retard any plans by "Wintershall" to press for legislation permitting free competition, it at least gives this enterprise a 3-year space in which to expand and organize for a more intensive mass production program thereafter.

In addition to its merging of the larger enterprises, "Wintershall" is likewise assimilating some of the smaller concerns. Thus it is understood that it has acquired for a period of 30 years the production quota of the "Ummendorf" concern, closing the latter down, and that it is gaining influence with the "Rothenfelde" producers, mentioned above. Another transaction of considerable importance appears to be a deal with the "Burbach" concern whereby "Wintershall" exchanges shares of "Glueckauf-Berka" for a three-fourths majority of shares of "Gewerkschaft Ellers," belonging to the "Burbach" group.

It is observed that "Wintershall" is specializing particularly on non-syndicated byproducts of the potash industry, such as glauber salts, bitter salts (epsom salts), magnesium chloride, bromine, etc. The merchandizing of these products is in the hands of the "Kali-Industrie Handels A. G.," in Berlin, Schöneberger Ufer 13.

Importance of Byproducts

Absence of sulphate structures, as well as of carnalit ($KCl.MgCl_2.6H_2O$) in the Alsatian mines deprives the works there of profit from byproduct production, the importance of which must not be underestimated. Thus the German works on carnalit salts, which are estimated as being about 25 per cent of all German potash salt deposits, can produce magnesium chloride, which is a byproduct of varied industrial application, as for

instance, in the manufacture of flooring materials, textiles, millstones, chemical disinfectants, fire-extinguishers, fireproofing woods, and in the artificial ice industry. The German potash industry produced 58,000 tons of magnesium chloride in 1923, for instance, and could produce much greater quantities if market demand warranted.

Likewise, carnalit liquors are the basis of bromine manufacture, which is sometimes referred to as a German monopoly despite our American and some French (Tunisian) development. The last war proved Germany to be in an advantageous position in respect to the manufacture of bromine from potash, the product being used for chemical gases. Germany produced 1,140 tons of bromine from its potash in 1923, or about twice the amount produced in 1913, as the market assimilates more now than then.

The importance of these byproduct possibilities is obvious. The concurrence of the chloride and sulphate of magnesium in German potash, as well as the presence of relatively pure rock salt, should tend to cheapen ultimate costs to the American consumer, once the German or French-German monopoly were discontinued. Of interest in this connection is a remark made by the well-known Nicodem Caro, of the Frank-Caro process (cyanamide): "In the course of time, the German potash industry will be the byproduct industry, while the salts will be refined preferentially for those chemicals that are now considered chiefly as byproducts for industrial uses."

Are Lead Chamber Processes Reversible?

By Andre Graire

Translated by F. C. Zeisberg, du Pont Company, Wilmington, Del.
Original reference, *Comptes rendus* (1924), vol. 179, pp. 397-400.

Sulphuric acid production men will be especially interested in this note. It seems to indicate that the chamber process reactions are reversible reactions. The translator points out that except for point No. 5 there is no new experimental material, but it does present a series of pertinent facts from a new viewpoint.

IT IS KNOWN that the formation of sulphuric acid in lead chambers is based upon oxidation reactions of sulphur dioxide gas in the presence of water vapor, acids and oxides of nitrogen. The mechanism of the catalytic action of these nitrogen compounds has not been completely established up to the present, because of the low concentration and the instability of the intermediate products formed during the process. These products are nitro sulphonic acid ($HNOSO_3$) and nitroso sulphonic acid ($HNOOHSO_3$), of Raschig; nitroso disulphonic acid $(NOHSO_3)_2$, of Trautz; nitrosyl sulphuric acid, or the acid sulphate of nitrosyl ($HNOSO_4$), of Lunge and Sorel.

Universally, and whatever may be the differences in the theories put forward on this subject, it is recognized in general that the intermediate reactions in the chambers end finally in successive oxidation phenomena with a reduction of the nitrogeneous compounds. Qualitatively, the total equations are then as follows:

$$2SO_2 + 2NO_2 + 2H_2O = 2H_2SO_4 + 2NO \text{ and}$$
$$2NO + O_2 = 2NO_2.$$

On the other hand, it is equally agreed that sulphuric acid is not capable of existing in the gaseous state below 170 deg. C. and that consequently it cannot be met with in the atmosphere of the chambers except in the form of fog or droplets. Finally, the gross reactions of manufacture, within their usual temperature limits (20 to 105 deg.), are considered essentially irreversible because of the stability of the sulphuric acid formed in the presence of the reducing agents.

But the preceding considerations and the theoretical consequences which result therefrom appear to us in disagreement with the observations which we will mention below.

1. It is known that in the determination of nitric nitrogen in the nitrometer it is customary to use a sulphuric acid of about 90 per cent strength. It is well known that for a higher concentration the volume of nitric oxide evolved decreases little by little even at ordinary temperatures, and the analysis loses all its precision. Confirming this observation, Bodenstein has remarked, in the course of his researches upon the speed of oxidation of nitric oxide, that it is impossible to store this gas over 66 deg. Bé. sulphuric acid because of a slow dissolution of the nitric oxide with the evolution of sulphur dioxide. This fact, moreover, led Bodenstein to substitute mercury for sulphuric acid in his apparatus.

2. When they occur in the liquid phase, the reactions of formation of sulphuric acid vary with the concentration of hydrogen ions between very wide limits.

It is known that in aqueous or feebly acid solutions, the reaction between sulphurous and nitrous acids is complete and irreversible because of the formation of sulphuric acid and nitrous oxide:

$$2H_2SO_3 + 2HNO_2 = 2H_2SO_4 + N_2O + H_2O$$

On the contrary, in concentrated sulphuric acid solution (98 per cent H_2SO_4), nitrogen trioxide, N_2O_3, is without action upon sulphur dioxide and nitrosyl sulphuric acid may be considered as the sole stable product. Finally, in the presence of a moderately dilute sulphuric acid—that is to say, under the conditions existing in the chambers—the reaction is almost always incomplete. The final product, intermediate between the protoxide and the trioxide, tends indeed to limit the formation of sulphuric acid. One may thus explain the frequent and simultaneous presence of sulphurous and nitrous acids in the 60 to 70 per cent H_2SO_4 of the lead chambers.

3. When they occur in the gaseous phase, in an

atmosphere of which the water vapor tension corresponds to the sulphuric acid concentration of the chambers, the reactions of sulphuric acid formation are limited by the reverse reactions. It is an experimental fact that the oxidation of sulphur dioxide occurs principally in the front part of the lead chambers, the rear of each chamber being utilized for the condensation of acid formed. The curve of oxidation of sulphurous acid tends thus toward an asymptote, of which the value depends only upon the water vapor tension or, what amounts to the same thing, upon the average temperature of the lead chamber under consideration.

The preceding observations thus lead to a review of the theories that make the formation in the head end of the chambers depend principally upon the mixing movement of the gases resulting from the connections between the chambers. The intensity of the reaction in the head end depends solely, we believe, upon the sharp diminution of the water vapor pressure effected in the midst of a gaseous mixture in equilibrium.

4. It frequently happens, when the final product has not been eliminated, that under various influences the reaction in the rear of the chamber reverses itself. One then detects an increase in the SO_2 concentration which may add in certain cases 0.2 to 0.3 volume per cent, which, in turn, corresponds to nearly 0.5 per cent of the total products of the chambers. This phenomenon is particularly frequent in the last chambers of a set.

The same action may be made to appear by laboratory tests. By introducing into a reaction chamber at 85 deg. C. a gaseous mixture having the composition 2.9 per cent SO_2, 8.94 per cent H_2O, 0.87 per cent NO_2, 7.82 per cent O_2 and 79.39 per cent N_2, Forrer has established not only that the oxidation of sulphur dioxide was zero but that the catalyzing acid (67 per cent H_2SO_4) used to moisten the walls of the chamber disappeared almost completely.

5. It results finally from our observations that the reduction of sulphuric acid is particularly noticeable with low SO_2 concentrations—that is, that the exits of the set are even better than those of the Gay-Lussac towers. We have been able to demonstrate under experimental conditions which excluded every source of error that gases almost entirely deprived of their sulphur dioxide content (less than 0.05 per cent by volume) upon their entrance to the Gay-Lussac tower often contain upon their emergence from these towers appreciable contents of sulphur dioxide (from 0.1 to 0.3 per cent). It is consequently beyond doubt that in this case the sulphur dioxide gas resulted from nothing else than the decomposing action of the gas leaving the set on the sulphonitric acid which irrigated these towers.

These experimental results, moreover, confirm the experiments of Trautz and the observations made by this savant of an evolution of sulphur dioxide upon agitating nitric oxide with a sulphonitric acid containing 93 per cent H_2SO_4 and 1.22 per cent HNO_3.

From the preceding facts it seems that it may be concluded that the reactions in the lead chamber process are reversible. Even though the intermediate substances which are formed in the course of this manufacture are still unknown, it does not seem longer open to doubt that the processes of their formation and their decomposition are ruled by the ordinary laws of equilibrium displacement and that the direction and the speed of these reactions depend solely upon physical-chemical phenomena of exchange between the gas and liquid phases.

Crisis in the French Aluminum Industry

French aluminum founders and fabricators are complaining of a shortage of metal and are asking for an investigation of the facts. One of the most important manufacturers has stated that the production of aluminum in France is well below the domestic demand. From the annual import statistics of the metal in one manufactured form or another this is readily to be accepted.

Most of the French plants reducing the bauxite ore of the south of France are located in the Alpine regions in the valley of the Isère, from which they derive their power. During the winter months and at other times when water is low there is a scarcity of power, and aluminum production is reduced.

French aluminum foundries are booked for long ahead with orders, due to the inability to deliver, which in turn is due to the impossibility of securing the aluminum metal in pigs in required quantities. The tonnage of output on the two counts is frankly insufficient and the founders and fabricators of sheets and wire are daily refusing orders from various consuming industries which have grown up around the virtues of this *metal blanc*.

Manifestly it is poor economics to go abroad for that which the country ought to be able to supply itself. Aluminum from abroad pays a customs tax of 2 francs per kilo, times a coefficient of 4, in all 8 francs per kilo. The price of the metal in France is approximately 10 francs a kilo—a well-protected industry, but protection is a boomerang in this case.

The users of aluminum are demanding the suppression of the tariff, whereas the producers of bauxite ore at the mine, as well as the refiners, are demanding that the protective clause be retained and that the tax be in no way reduced. The result is deadlock and in spite of the disposition to produce up to the limit of facilities—no accusation being made of an attempt to strangle the output—the consumer is having difficulty in meeting competition from abroad with respect to orders in hand actually.

In 1922-23 aluminum stocks were ample throughout the world. Since that time consumption has so greatly increased that, so far as France is concerned, with existing production facilities and conditions surrounding them, the shortage of the metal is becoming acute.

New plants are being built in various locations, the supply of bauxite ore from the Mediterranean departments of France being, if not inexhaustible, at least sufficient for perhaps generations to come. The most notable new development is at the Auzat plant in Savoy and another which the same company is building in the Bouches du Rhône, with still another under construction in the Pyrenees which will have ample water power and reasonable accessibility to the deposits around Beziers, west of the Rhône.

Cost of Helium

Owing to an inadequate natural gas supply, the government helium plant has never, except for four periods of approximately one month each, been able to operate at full capacity. R. R. Bottoms, superintendent of the government plant at Lakehurst, N. J., in a recent article (*Oil & Gas Journal*, Nov. 20, 1924, p. 80) states that under these adverse conditions the average cost of helium has been approximately $78 per 1,000 cu.ft., the lowest cost to date being $61.

Safety in Grinding Sulphur and Hard Rubber

Operating in an Atmosphere Containing Less Than 8.5 Per Cent Oxygen With Sulphur and Less Than 13 Per Cent Oxygen With Hard Rubber Will Eliminate the Danger of Dust Explosions

By H. W. Frevert
U. S. Bureau of Chemistry, Washington, D. C.

IN GRINDING and pulverizing flammable materials, there are a number of operations in which dust and air mixtures of highly explosive character may be formed. Grinders, screens, air separators, conveyors and collectors present distinct hazards and some plants have found it advantageous to inclose all such equipment and operate it in an inert atmosphere.

Successful application of the use of inert gas in the prevention of ignition and explosion has been reported by Dodge for the process of drying treated fabrics and recovering the solvent vapors, in which the inert gases were recirculated through the unit. (*Chem. & Met.*, 1922, vol. 26, p. 416.) However, no specific experimental study of the maximum safe proportion of oxygen in the vapor and gas mixture was reported. This factor is, of course, of great importance in the design and operation of inert gas systems from the viewpoint of both safety and economy. It has been determined for several cereal dusts and one coal dust by H. H. Brown and J. K. Clement (*J. Ind. Eng. Chem.*, 1917, vol. 9, p. 347), and it is the purpose of this investigation to extend their studies to the problems of sulphur and hard rubber dust. Their data on the oxygen limit at and below which mixtures were non-explosive were as follows: dextrine, wheat starch, flour, 12 per cent oxygen; oat and corn elevator dust, wheat elevator dust, 14 to 14.5 per cent oxygen; standard Pittsburgh coal, 16 per cent oxygen. These laboratory results were substantiated later by field tests in an inclosed experimental milling unit operating with fine cornstarch and dextrine, and it was recommended that an atmosphere of not more than 12 per cent oxygen be used to give a margin of safety. (See Price and Brown, "Dust Explosions," p. 95, N.F.P.A., Boston, 1922.)

In the present investigation, explosibility was determined for sulphur dust and for hard rubber dust when ignited in mixtures of oxygen, carbon dioxide and nitrogen containing successively decreasing proportions of oxygen. The oxygen content at which explosibility rapidly decreased was observed and this point represents the dilution with inert gas necessary to prevent propagation of flame in the mixture.

Expressed in general terms, each test consisted in filling a 1.4-liter spherical glass explosion bomb with an analyzed mixture of carbon dioxide, oxygen and nitrogen from a gas holder and in igniting a previously placed charge of dust as it was thrown into suspension in this gas. The apparatus as modified for use in this work is shown in Fig. 1. The desired gas mixture was made in the 150-liter gas holder by connecting the desired cylinders of gas as shown by the dotted lines. Flow of gas in or out of the gas holder was measured by the pipe guide *b*, and a pressure of 0.2 lb. per sq.in. was maintained by the weight of water placed on the bell. By means of a paddle agitator, thorough mixing of the gas could be assured one-half hour after filling. The explosion bomb differed from that used by Brown and Clement in one feature: The use of a cup *l* as described by Trostel and Frevert

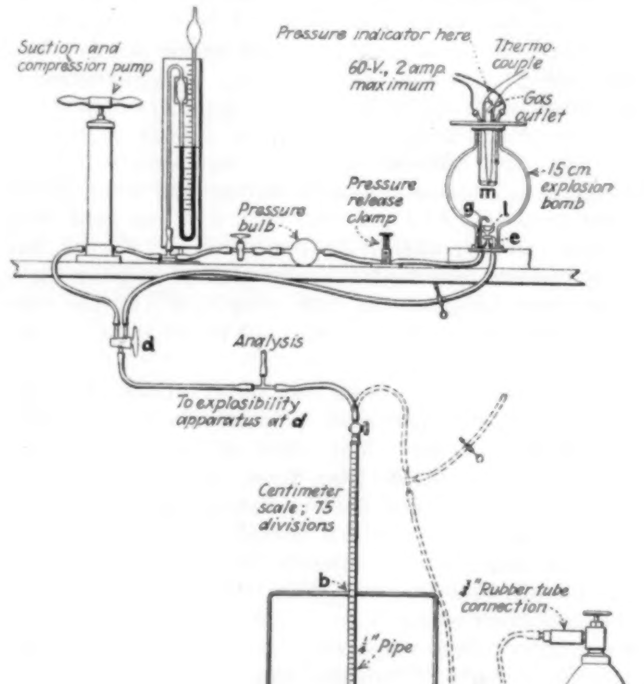


Fig. 1—Apparatus Used

Mixtures of carbon dioxide, oxygen and nitrogen in the desired proportions were made in the gas holder and fed into the explosion bomb through *d*. The dust sample was placed in *l*, blown into suspension by sudden release of gas from the pressure bulb and subjected to a temperature of 1,200 deg. C. at the glower *m*. Evidence of explosibility was obtained visually and more reliably through the pressure recorded by a Crosby indicator.

Table I—Explosibility of Sulphur Dust in Mixtures Containing Inert Gas

Concentration of Sulphur—210 Mg. per Liter of Gas

Gas for Explosibility Tests: Oxygen A Per Cent	Carbon Dioxide B Per Cent	Oxygen and Carbon Dioxide* $A+B$ Per Cent	No. of Tests	Products of Combination: Oxygen C Per Cent	Oxygen Decrease by Ignition $A-C$ Per Cent	Sulphur Dioxide and Carbon Dioxide D Per Cent	Sulphur Dioxide Formed by Ignition $D-B$ Per Cent	Oxygen Sulphur Dioxide and Carbon Dioxide* $C+D$ Per Cent	Sulphur Burned, Mg. Per Liter	Combustion Pessure Lb. Per Sq.In.
15.8	5.5	21.3	3	10.1	5.7	11.1	5.6	21.2	81	11.0
14.1	5.1	19.2	7	9.1	5.0	10.1	5.0	19.2	72	9.7
12.7	3.2	15.9	3	8.8	3.9	7.3	4.1	16.1	59	9.1
12.0	9.5	21.5	4	8.1	3.9	13.0	3.5	21.1	51	7.8
10.7	9.8	20.5	3	7.6	3.1	12.7	2.9	20.3	42	5.5
9.9	11.4	21.3	3	8.4	1.5	12.9	1.5	21.3	22	3.3
9.8	10.0	19.8	4	8.3	1.5	11.4	1.4	19.7	20	3.9
9.6	10.5	20.1	3	8.1	1.5	11.8	1.3	19.9	19	3.4
9.2	11.7	20.9	3	8.1	1.1	12.6	0.9	20.7	13	2.7
9.0	11.8	20.8	3	8.1	0.9	12.5	0.7	20.6	10	1.6
8.7	11.5	20.2	3	7.9	0.8	12.2	0.7	20.1	10	1.0
8.2	12.8	21.0	3	7.6	0.6	13.4	0.6	21.0	9	0.6
6.2	13.7	19.9	3	5.5	0.7	14.3	0.6	19.8	9	0.3
0.8	0.0	0.8	3	0.7	0.1	0.1	0.1	0.8	1.4	0.1

*$A+B=C+D$ (The remainder was nitrogen). $A-C=D-B$.
Flame observations: 15.8 per cent oxygen, positive propagation. 14.0 per cent to 9.8 per cent oxygen, indistinct flame. 9.6 per cent to 0.8 per cent oxygen, no flame distinguished.

(*Chem. & Met.*, 1924, vol. 30, p. 141) for holding the test sample of dust. The dust was put in suspension by blowing down from a fine jet shown at *g*. The igniter *m* was similar to that described by Brown and Clement. It was an electrically heated cylindrical glower 0.7x2.5 cm., with platinum foil surface in contact with a thermocouple for temperature measurement. The pressure resulting from ignition of the mixture actuated a Crosby indicator, which registered on a stationary smoked card. The measured readings, with an appropriate small correction for pressure caused by compressed air admitted in blowing dust into suspension, were recorded with the corresponding composition of the gas admitted to the bomb before ignition.

In making the test a large sample of sulphur was first carefully spread in the dust blowing cup *l*. Then all air in the bomb was replaced with the gas mixture by passing a stream of the mixture through the bomb for 3 minutes. Where equilibrium was being established the ignition glower at the center was being heated to 1,200 deg. C. Bomb inlet and outlet were then closed and the sample of dust was thrown into suspension by a sudden release of compressed gas from the bulb and ignited by the glower at 1,200 deg. C.

Preliminary experiments with sulphur concentrations of 15 and 55 mg. per liter of gas indicated, as shown in two of the curves in Fig. 3, that the critical oxygen content was about 9 per cent. In order to determine the safe oxygen limit for a much more explosive concentration, it was necessary to determine the most explosive concentration of sulphur in an atmosphere a little above the non-explosive limit in oxygen. From the pressure and ignited by the glower at 1,200 deg. C. assumed to be the best value for the most explosive concentration. This density, equivalent to a total sample of 300 mg., was investigated in two series of tests, with sulphur and with hard rubber, to determine the effect of oxygen reduction in a dense dust cloud.

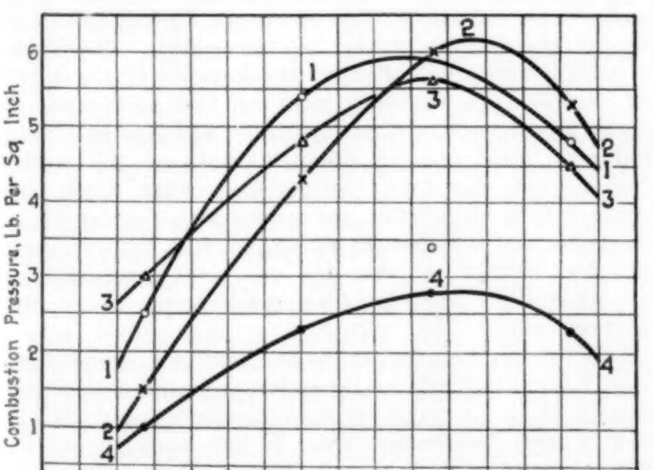


Fig. 2—Most Explosive Concentration of Sulphur Dust

Curve 1—Oxygen 10.0 per cent
Curve 2—Oxygen 9.8 per cent
Curve 3—Oxygen 9.7 per cent
Curve 4—Oxygen 9.3 per cent

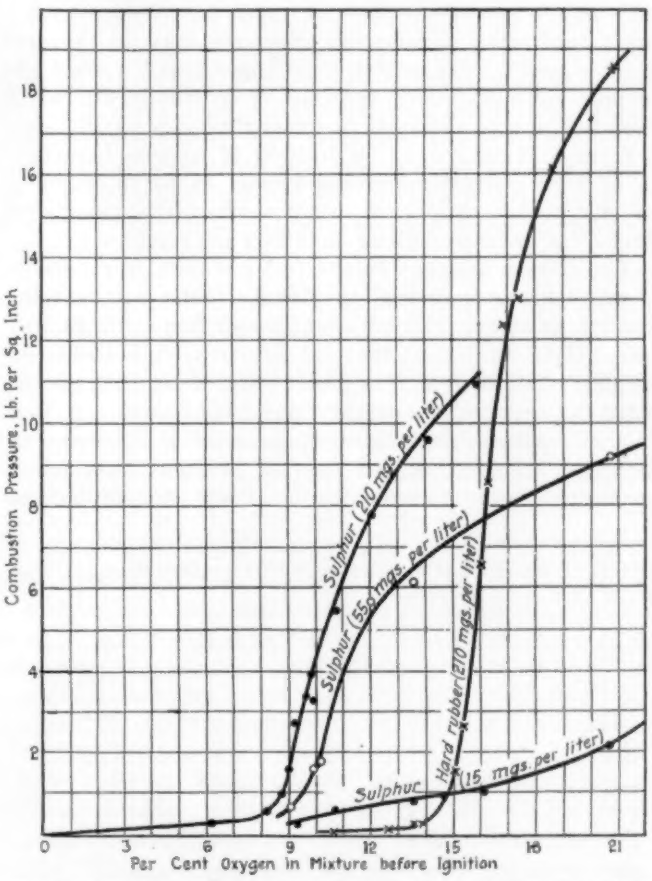


Fig. 3—Effect of Oxygen Reduction on Explosibility of Sulphur and Hard Rubber Dust

Sulphur (15 mg. per liter): No flame at 9 per cent oxygen.

Sulphur (55 mg. per liter): No flame apparent at 9 per cent oxygen; distinct flame at 10 per cent oxygen.

Sulphur (210 mg. per liter): No flame apparent below 9.5 per cent oxygen; indistinct flame below 14 per cent oxygen.

Hard rubber: Flicker of flame on glower at 12.5 per cent oxygen; positive flame at 13.5 per cent oxygen; partial propagation at 15 per cent oxygen.

The results of the sulphur explosibility tests with the oxygen in the mixture varying from 15.8 to 0.8 per cent are recorded in Table I. The relation of explosibility to the percentage in oxygen is clearly shown in Fig. 3 to be somewhat similar to that for a 55 mg. per liter concentration in that a point of abrupt change is observed at about 9 per cent oxygen.

No flame could be definitely observed in mixtures containing less than 9.5 per cent oxygen. Since, however, a point of decided change in combustion pressures was obtainable, and since pressure developed by combustion was after all a measure of the danger involved with these dusts in a closed system, the relationship between percentage of oxygen and combustion pressure was used to determine the critical point. This was supplemented by observations of flame, and, in the case of sulphur, by analysis of the products of combustion (Table I). The safe limit in percentage of oxygen in a sulphur mixture, as shown by the relationship of pressure to percentage of oxygen (Fig. 3), and by the relationship of percentage of sulphur dioxide formed to the percentage of oxygen before ignition (Fig. 4A), may be stated as 8.5 per cent under conditions such as those described. Apparently very small combustion pressures may be expected at this point. Explosibility increases rapidly when the oxygen content before ignition is increased above 8.5 per cent and the change in explosibility is small below 8.5 per cent oxygen. The dilution of oxygen necessary to prevent combustion would appear to be independent of the concentration of sulphur when the graphs of Fig. 3 for various sulphur densities are compared.

The critical oxygen content (8.5 per cent) for sulphur is much lower than that previously found for dextrine and wheat starch (12 per cent) under like conditions of test. It is significant that the ignition temperature of sulphur (261 deg. C.) is much lower than that of the more explosive of the cereal dusts (540 to 640 deg. C.).

Hard rubber dust, mainly because of a difference in chemical composition and ease of ignition, was found to require less oxygen dilution than the sulphur to prevent explosion. On the basis of flame observations and the relation of combustion pressure to oxygen in the bomb as shown in Fig. 3 and Table II, it may be said that danger of explosion of hard rubber dust of like composition ceases when the oxygen has been diluted to 13 per cent by volume of the mixture, and that explosibility is low at 14 per cent oxygen.

Credit is given L. J. Trostel, formerly of the Bureau of Chemistry, who outlined the original problem and under whose supervision this work was begun.

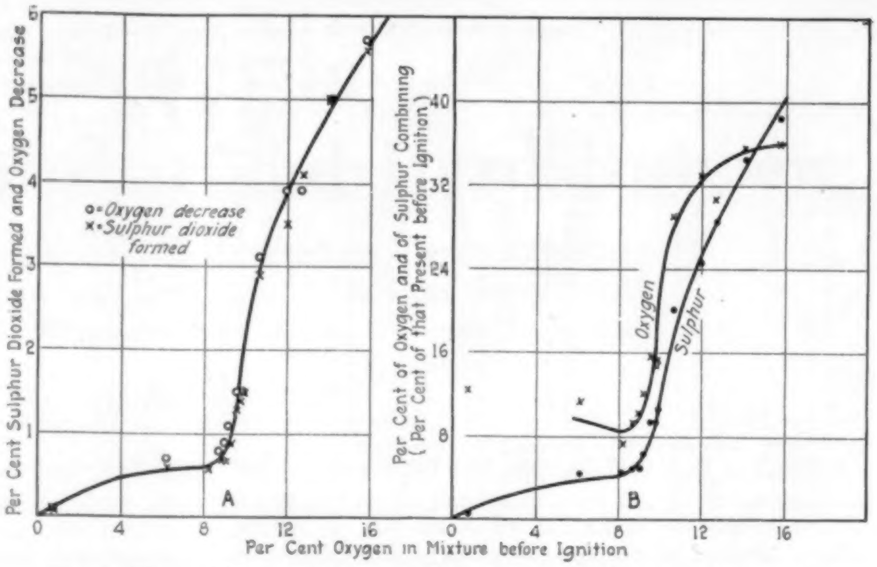


Fig. 4—Flammability of Sulphur as Shown by Analysis of Residual Gases
A—Sulphur dioxide formed is volumetrically equivalent to decrease in oxygen.
B—These curves show the extent to which sulphur and oxygen reacted to form sulphur dioxide. Even at 16 per cent oxygen less than half the oxygen and sulphur combined.

Table II—Explosibility of Rubber Dust in Mixtures Containing Inert Gas

Gas for Explosibility Tests: Oxygen, Per Cent	Carbon Dioxide, Per Cent	Oxygen and Carbon Dioxide* Per Cent	No. of Tests	Combustion Pressure Lb./Sq.In.	Appearance of Flame
20.8	0.0	20.8	3	18.6	Full propagation
18.6	2.9	21.5	3	16.2	Full propagation
17.4	4.4	21.8	4	13.1	Full propagation
16.9	3.8	20.7	3	12.4	Full propagation
16.3	4.1	20.4	5	8.6	Full propagation
16.0	4.5	20.5	4	6.6	Full propagation
15.4	4.2	19.6	3	2.7	Partial propagation
15.0	4.5	19.5	4	1.6	Partial propagation
13.9	6.3	20.2	3	0.3	Positive flame at glower
13.6	6.8	20.4	3	0.3	Positive flame at glower
12.7†	10.8	23.5	3	0.2	Flicker of flame at glower
10.7	26.1	36.8	3	0.1	Slight flicker about ¼ in. high at glower.

*The remainder was nitrogen.
†Corn starch and corn elevator dust were tested in the same way to determine whether a slight flame at the glower persisted at low percentage oxygen as with hard rubber. No flame resulted in 3 trials with each of these dusts at 12.7 per cent oxygen.

Loss in British Export Trade in Cyanides Explained

In explaining the loss of its American business, the managing director of the British Cyanides Co., Ltd., among other things said: "Of late years an American company has produced a low-grade cyanide which is used largely in the gold-mining industry and which can be bought today at a price far below the pre-war value of the high-grade cyanide, which then was used universally. The American company now has gone into trade in ferrocyanides, for which the United States is by far the largest market in the world. The trade is highly protected. Behind the barrier of the tariff an organization has been built up that has captured practically the entire American trade and is able to fight European producers in other markets of the world. The result is that ferrocyanides are selling at pre-war prices. It is impossible for us to manufacture these chemicals and sell them at pre-war prices with a profit, in spite of the fact that the gas works, recognizing our difficulties, are accepting much lower prices for sulphocyanide."

Loss of market for cyanogen products forced the British company into an intensive program of research looking to the creation of new products which would offer a more profitable field. It has been announced that a very promising new chemical has been made from sulphocyanide which can be used to great advantage in connection with the vulcanization of rubber. A large new plant has been erected for the manufacture of this product, the nature of which is being kept secret.

On the Engineer's Book Shelf

Present Status of Coal Carbonization

Reviewed by Paul D. V. Manning

Chemical Engineer, New York City

COAL CARBONIZATION. By *Horace D. Porter*. 442 pages, 175 illustrations. Chemical Catalog Co., New York. Price, $6.

In this timely book the author has given an unbiased treatment of the various economic phases of the subject with a careful presentation of the technology. He has succeeded in steering a course that is a compromise between the enthusiasm of the economist and the exacting requirements of the scientist, in his general considerations. The resulting work is a most interesting and easily read volume dealing not only with the general and more far-reaching aspects of the carbonization of coal and its relation to our future fuel problems but also with a complete and accurate description of the various types of coke ovens and processes.

Thus, while recognizing the value and the necessity for the full development of the industry, the author does not believe that coal carbonization is the panacea for the fuel ills which the extremists in conservation would have us believe, for we read: "Coal must needs be used as industry and civilization require, with as little expenditure as possible of the resource itself and of other assets, as labor and miscellaneous materials. It is likely to be carbonized, and properly should be carbonized—only to the extent that the economic demand for the special products thus derived creates prices that make treatment profitable. There will not be a gain in fuel economy or any progress in conservation by carbonizing coal, if less of useful energy is obtained in the total coke, gas, tar and light oil than can be made available from the raw coal itself directly applied."

The introduction by S. W. Parr emphasizes the slow development of the industry during the first 75 years of its existence. The smoke problem here is taken up and through the discussion we discern the hint that all coal should be carbonized before use.

The first chapters of the book discuss the general problem and features of coal carbonization and its relation to fuels and power. Conservation of coal is shown to be best attained through progress in engineering efficiency and lowered costs caused by economic pressure. Such progress will come through the extended use of gas, centralization of power production, electrification of railways, development of water power, boiler plant economies, etc.

The industrial systems of carbonizing are compared, the new developments being listed. The nature of coal carbonization is fully discussed from the point of view of the research chemist and the engineer, some space being devoted to the constitution of coal and the mechanism of carbonization.

The larger part of the treatise is given over to byproduct coking methods, apparatus, theory, description, uses and the products of such carbonization. In this connection a large amount of data in the form of tables and charts is given. Such illustrations are found throughout the book and are supplemented by photographs of actual plants and apparatus. These have been well selected.

The gas industry is treated in all its aspects from a broad viewpoint, the author believing that the greatest potential developments of coal carbonization lie in the extended use of gas in the homes and in industries and advocating a lowered heating value requirement. Further potential developments are the low-temperature carbonization of coal to the point of a possible yield of 20 gal. per ton of oils for motor fuels and large combination central stations.

Other chapters give facts and discussions on the nitrogen and sulphur compounds in coal, historical and recent methods of carbonization, heating of ovens, gas making, miscellaneous projects in carbonization and low-temperature carbonization. The small amount of space devoted to the latter topic is perhaps the only disappointing feature of the book. This is explained by the statement that low-temperature carbonization has not yet attained or "given assurance of attaining enough commercial success to warrant a principal place."

As for the purpose of the book, the author's words are: "The engineer designing, building or operating a coal carbonization plant will not find this a manual fulfilling all of his requirement of information. The book is intended more particularly for the average technically trained man, chemist, business executive, or engineer, who requires a knowledge of the principles and an outline of the practice in coal carbonization." It is more than that. It is readable and interesting—a book well worth having.

How to Organize and Manage a Technical Organization

Reviewed by Dr. Charles L. Reese

Chemical Director, E. I. du Pont de Nemours & Co.

THE TECHNICAL ORGANIZATION: Its Development and Administration. By *John M. Weiss* and *Charles R. Downs*. 197 pages. McGraw-Hill Book Co., New York. Price, $2.50.

I have read Weiss and Downs' little book with a great deal of interest, and as it is undoubtedly written as a result of their experience in handling the former great development laboratory of The Barrett Co., it is interesting to see how their experience parallels in so many ways my own experience in handling the chemical work of the du Pont company during the last twenty-odd years.

I believe the book will do much toward bringing about what the authors say at the end of the first paragraph of their preface—that is, "that the relations of the industrial man and his scientific employee may be improved to their mutual benefit."

The book should be read by all who are interested in industrial research, from the director down to the works chemist. Ira Remsen once said to me, in speaking of a certain book, that there is no book so bad there is not something good in it. Of this book I can

say that it is mostly good and it is hard to find anything bad in it. The first two chapters, on selection and development of personnel, and organization, and the last chapter, on cost accounting and profit, should be read by executives who have to do with the establishment and financing of industrial research, and also by those who have the responsibility of managing and directing the work. The other chapters, on layout and housekeeping, notebook records, etc., operating methods and safety and fire, are especially of interest to those responsible for the direct management of existing laboratories, and the whole book would be invaluable to those who are contemplating organizing such laboratories.

The work does not contain anything that may be considered new, nor any revolutionary ideas, but it is a splendid common-sense presentation of most of the problems and conditions that must be met in the establishment, management, financing and accounting of a commercial research organization. Although industrial research stands on a much firmer footing in this country now than it did a quarter of a century ago, and also than it does in many foreign countries, yet there are many industries in our country the management of which do not appreciate either the value or the importance of such an undertaking for the purpose of stabilizing and caring for the future, or they cannot understand how it can be made to pay. The book under review will be of much assistance to such who doubt and will show the way to those who wish to know how.

Natural Science

THE DOMAIN OF NATURAL SCIENCE. By *E. W. Hobson*, Fellow of Christ's College, Cambridge. 510 pages. New York: The Macmillan Co. Price, $6.50.

This book contains the Gifford lectures delivered at the University of Aberdeen, 1921-22, the main object of which, as the author states in the preface, was to provide a reasoned contribution on a subject that has given rise to divergent opinions among earnest thinkers: The position that the scientific view of the world should rightly occupy in relation to the other factors of human experience with which religion and philosophy are concerned. The lectures are delivered at intervals by a scholar of high standing, according to the provisions of a bequest by Lord Gifford, who, desirous of furthering "the true knowledge of God," nevertheless made no stipulation in regard to the religious inclinations, if any, of the lecturer. He enjoined the "patrons" that they use diligence to secure "able, reverent men, true thinkers, sincere lovers of and earnest inquirers after truth . . . to treat their subject as a strictly natural science . . . without reference to or reliance upon any supposed exceptional or so-called miraculous revelation."

Doctor Hobson has discussed the subject with such completeness that the best course a reviewer can take is to refer those interested to the book itself. The material of which these lectures is composed is incapable of being condensed in bulk, whereby even an impression of the contents could be gained by the perusal of a brief review such as this must be. The author speaks with care and deliberation, and as the result of much intensive research. The volume should provide a liberal education in a phase of existence and metal outlook to which it is not usual to pay much attention; it is divided into twenty sections, captioned as follows: I—Introduction; II—Scientific Laws and Theories; III—Natural Science in Relation to Philosophy; IV—Causative and Deterministic Systems; V—Number and Its Development; VI—Time and Space; VII—Corpuscular Theories of Matter; VIII—Dynamics; IX—Conservation of Matter and Energy; X—Mechanical Theories and Thermodynamics; XI—Electricity, Magnetism and Light; XII—Constitution of Matter; XIV—Einstein's Theory of Relativity; XV—Biological Science; XVI—The Living Organism; XVII—Heredity; XVIII—Evolution; XIX—Natural Science and General Thought; XX—Natural Science and Theism.

A. W. ALLEN.

The Art of Business Writing

PRINCIPLES OF BUSINESS WRITING. By *T. H. Bailey Whipple*, literary critic, Westinghouse Electric & Manufacturing Co. Westinghouse Technical Night School Press, East Pittsburgh, Pa.

"Language not only is an essential and most effective business tool, but it differs from all other business tools in that it is a handle that fits all these other tools."

The writer of this book thus begins one of his chapters in the endeavor to convince his readers that correct use of language has a distinct place in the field of business literature. It would seem not to be open to argument that as between one who knows how to sell his wares by the use of concise, telling phrases and one who rambles incoherently far afield, the advantage is with the former. Mr. Whipple truly says that many of our technical and scientific colleges have neglected the teaching of language, assuming that their students had previously acquired this art in the preparatory and high schools. "However," he adds, "business is awakening to the dignity and importance of efficient correspondence; and it is my prediction that within less than 5 years not less than 10,000 positions for competent correspondents will be open in the United States, at salaries ranging from $3,000 to $5,000 a year; and that hundreds of positions will be open to correspondence supervisors and advertisement writers at salaries ranging from $5,000 to $20,000 a year."

This book was prepared originally for circulation among the employees of the Westinghouse company—to stimulate them to better preparation of reports and better letters to the company's customers. However, the demand for it from both inside and outside the company necessitated reprinting in more substantial form than at first contemplated.

In the second division of the book Mr. Whipple lays down the principles of business letter writing, emphasizing clearness, conciseness, completeness, correctness, courtesy and tact, as well as originality, imagination and sympathy. Then he proceeds to enunciate the methods by which these principles may be applied.

There follow 84 pages of words and phrases often misused. The list, although of course not complete, contains 550 examples of phraseology to be avoided.

How reports should be prepared and the psychology of letter writing find place in the book. Not all of it is original with Mr. Whipple, for he borrows from the works of others abundantly, always giving due credit.

The principles he lays down are sound. The book is one that could be read with profit by any one who has occasion to write reports or business letters—and nearly all of us fall into that category.

C. N. HULBURT.

A Worth-While Series of Chemical Engineering Monographs

Crushing and Grinding

CRUSHING AND GRINDING MACHINERY. By *Hartland Seymour*, consulting chemical engineer. 138 pages, illuustrated. Ernest Benn, Ltd., London. Price, 6s.

As another volume in the series will cover pulverizing, this discussion is limited to machines in common use for reducing materials not finer than 10 mesh, grouped as: jaw breakers, gyratory crushers, crushing rolls, disintegrators and swing-hammer mills, centrifugal roll mills, ball and rod mills. In each chapter the author has selected what he considers a representative machine, describing this in detail and then discussing other machines where they differ from the one selected or where they have special features.

Screening

THE SCREENING AND GRADING OF MATERIALS. By *J. E. Lister*. 143 pages, illusrated. Ernest Benn, Ltd., London. Price, 6s.

The author has given a general survey of the wide variety of equipment available for handling grading problems: screens of all types, picking belts and tables, washers, classifiers, concentrators, vanners, jigs, flotation machines, air separators, cyclones, bag filters, magnetic separators, electrical precipitators and electrostatic separators.

Concentrating Sulphuric Acid

SULPHURIC ACID CONCENTRATION. By *P. Parrish* and *F. C. Snelling*. Vol. I, Hot Gases, 141 pages, 24 illustrations. Vol. II, In Heated Vessels, 147 pages, 30 illustrations. Ernest Benn, Ltd., London. Price, 6s. each volume.

Together these two volumes give a thoroughly practical survey of modern practice in concentrating sulphuric acid. Vol. I discusses the operation of the Glover tower as a concentrator, the Kessler and Gaillard concentrators, and the Cottrell process, brief mention being also made of the Trepex and Skoglund concentrators; Vol. II, concentration in lead pans, glass retorts, platinum stills, cascades, cast-iron pots and a few minor systems. Materials of construction, transport and storage of concentrated acid and possible future developments complete the subject matter.

Water for Industry

THE TECHNOLOGY OF WATER. By *Alan A. Pollitt*. 158 pages. Ernest Benn, Ltd., London. Price, 6s.

While the author has included a discussion of potable waters in order to cover his subject thoroughly, chemical engineers will find the sections on industrial waters and their treatment of more direct interest. Detailed consideration is given to boiler feed and the specific water problems of the fermentation, textile, leather, sugar and paper industries. The data on treatment cover general methods and principles rather than descriptions of equipment.

Efficient Production

ORGANISATION OF PRODUCTION. By *John W. Curtis*. 141 pages, illustrated. Ernest Benn, Ltd., London. Price, 6s.

Principles of scientific management are illustrated in this book by taking the specific case of a company designing and erecting gas plants and manufacturing in its own shops much of the equipment required. Organization of such work involves many difficulties not encountered in quantity production, where the production manager's duties ends when the finished materials are accepted for distribution. The charts developed in this case will be of particular interest to chemical engineering firms that supply and erect plants.

Co-operative Treatise Features New Books on Physical Chemistry

A TREATISE ON PHYSICAL CHEMISTRY: A Co-operative Effort by a Group of Physical Chemists. Edited by *Hugh S. Taylor*, professor of physical chemistry, Princeton University. 1260 pages, in two volumes, illustrated. D. Van Nostrand Co., New York. Price, $12.

In a co-operative endeavor of this character it is always of interest to know who the individual contributors are. Those who have made this treatise possible are:

H. S. Taylor, Princeton, atomic concept of matter, energetics of chemical change, reaction velocity in heterogeneous systems, photochemistry; Otto Maass, McGill, gaseous and liquid states; R. N. Pease, Virginia, solid state; A. L. Marshall, Princeton, thermochemistry; J. C. W. Frazer, Johns Hopkins, homogeneous equilibrium; A. E. Hill, New York University, heterogeneous equilibrium; G. A. Hulett, Princeton, electrical measurement; J. R. Partington, London, conductance and ionization; H. S. Harned, Pennsylvania, electrochemistry; N. H. Furman, Princeton, electrometric methods; F. O. Rice, New York University, reaction velocity in homogeneous systems; Saul Dushman, General Electric Co., quantum theory; W. H. Rodebush, Illinois, third law of thermodynamics; H. A. Taylor, Liverpool, infra-red radiations; W. A. Patrick, Johns Hopkins, colloidal chemistry.

This method of presentation has the obvious advantages of authority in each of the topics and of individuality in point of view, particularly valuable where theories are still in a state of development.

Quantum Theory

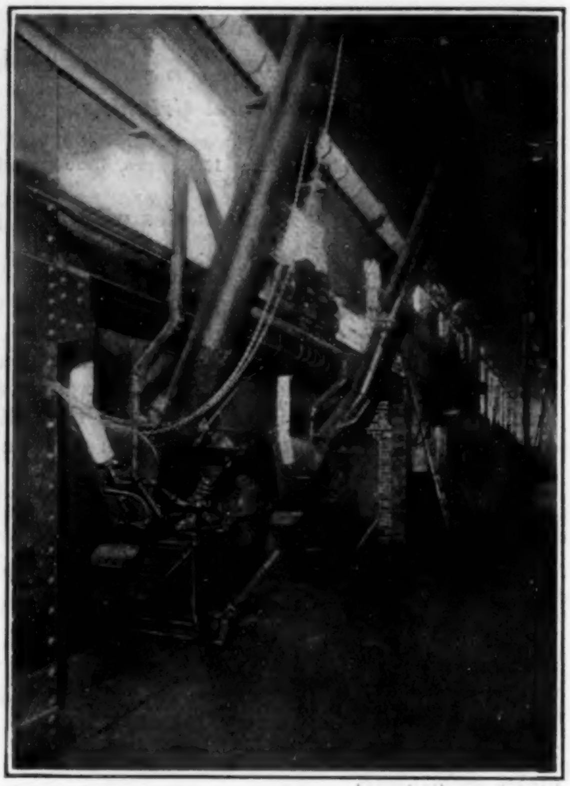
A SYSTEM OF PHYSICAL CHEMISTRY. By *W. C. McC. Lewis*, Brunner professor of physical chemistry, University of Liverpool. Vol. III, Quantum Theory, third edition, 401 pages, illustrated. Longmans, Green & Co., New York. Price, $5.

Rapid expansion in the volume of data bearing on the quantum theory has made necessary this third edition in order to present an adequate, up-to-date treatment of the subject. In size it is practically double that of the second edition, which in turn was developed from a single chapter in the first—striking evidence of the importance of this phase of physical chemistry.

Thermodynamics

CHEMICAL THERMODYNAMICS: An Introduction to Thermodynamics and Its Applications to Chemistry. By *J. R. Partington*. 275 pages, 43 diagrams. D. Van Nostrand Co., New York. Price, $3.

Although a new edition of "Thermodynamics, With Special Reference to Chemistry," practically every part has been rewritten, and the treatment has been simplified as well as brought up to date, so that it is really a new book. The data of investigators in all countries have of course been used, but the author in the preface emphasizes the inclusion of recent American work, "because it is particularly the countrymen of Willard Gibbs who have in recent years contributed most effectively to chemical thermodynamics." The textbook form is used, with a series of problems at the end of each chapter and very complete references to original sources.



(ABOVE) A parabolic coal storage bunker, crane type weigh larry and chain-grate stokers give the boiler plant of this large chemical works an equipment equal to all but the most modern of central stations—one that reduces labor to a minimum and insures the efficient use of the fuel.

(RIGHT) Underfeed stokers suit some fuels and some firing conditions better than other types, so this plant has installed them and also a full quota of control instruments, so that its supply of steam for paper-making and electric generation may be obtained at the least possible cost.

Well-Equipped Power Plants Pay Industry Dividends

HERE are four pictures taken in the boiler rooms of large industrial plants that use process steam—plants making such products as chemicals, pulp, paper and silica. The modern stokers, coal bunkers, weigh larrys and control instruments shown are evidence that as much attention is devoted to equipment in some industrial boiler plants as in the most modern central station.

Such a course, if combined with good operating methods, pays dividends to the plant that uses process steam. For high-pressure steam can be made, if the equipment is such as is here shown, at no greater cost than low-pressure steam and can be made to convert its high pressure into electric current, taking care of the power needs of the plant and meeting the process steam requirements at the same time with the lower pressure exhaust steam, in this manner providing power at a lower cost than the central station possibly could.

(LEFT) Chain grate stokers fire the boilers of this modern pasteboard mill, where a large process load demands steady and efficient production of process steam. In such a plant all the electric current needed can be generated by the drop from boiler pressure to process pressure and its cost can be kept well below 1 cent per kw.-hr.

(BELOW) The most efficient of boilers and an up-to-the-minute stoking installation help this silica plant prepare the raw materials for glass manufacture in an economical way. With such equipment the management can look at the boiler plant as a help rather than as a necessary evil, and can devote its worrying time to other matters, confident that the steam will be there when needed.

Equipment News

From Maker and User

Displacement Meter

At the recent equipment exhibition in connection with the American Gas Association convention in Atlantic City, the Connersville Blower Co., Connersville, Ind., presented an improved design of rotary displacement meter. This meter is in general similar to the well-known Connersville blower, the impellers being designed to operate with extreme ease, so that the inlet pressure of the gas serves to operate them.

One of the improvements is in the impeller shaft bearings. These are of a high-grade ball-bearing type and are now located in easily accessible chambers at the ends of the meter, with several intermediate chambers between them and the cylinder of the meter, so that impurities in the gas, that might cause corrosion, do not come into contact with the bearings. With these bearings, the resistance to operation of the impellers is so slight that the pressure difference on the two sides—inlet and outlet—does not exceed 1 in. water column, usually varying from $\frac{1}{10}$ to $\frac{3}{4}$ in.

Another feature is the new pressure-volume-temperature-time recording gage, which gives a complete record on one chart of the volume of gas passed, the inlet pressure, the inlet temperature and the rate of flow. The chart is driven by the meter, so that, by using an averaging instrument, a true average may be determined. Thus accurate corrections for pressure and temperature can be easily made.

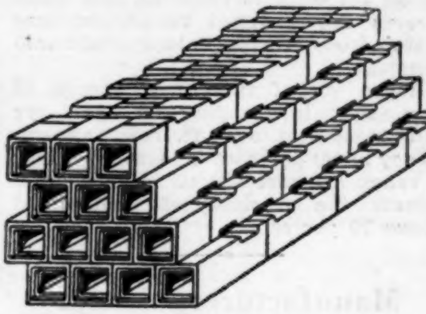


Fig. 1—Typical Lay-Up of Tile in Hermansen Type Recuperator

The tiles used for building this recuperator are of a special, light but strong refractory, capable of withstanding extremely high temperatures. They are made hollow, with a square bore, and are so shaped as to have outside notches in top and bottom running at right angles to the bore. When laid up as shown in the cut the waste gases pass through the bore or inside openings of the tile, while the incoming air passes through the transverse channels formed by the conjunction of the notches on top and bottom of the tile.

Saving the Heat of Waste Flue Gases

Such heating furnaces as glass tanks, pot furnaces and ceramic kilns, because of the high temperature of the gases that go to waste up the stack, often waste as much as 70 per cent of the heating value of the fuel burned. Various means have been adopted to do away with this loss, at least in part. One of the most recent, at least in this country, is the Hermansen Recuperator Furnaces. This design was developed in Europe and more than 10,000 industrial furnaces of this type have been built there. It is now being introduced into this country by the Combustion Engineering Corporation, 43 Broad St., New York, which has acquired the American rights.

These furnaces may be built in many different designs and types—to suit the particular application. They may also be designed to burn any of the usual industrial fuels—coal, oil and gases. The feature of all is the Hermansen Recuperator, a device that transfers part of the heat of the outgoing gases

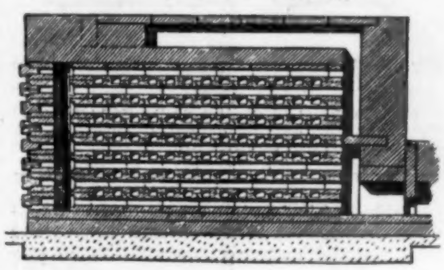
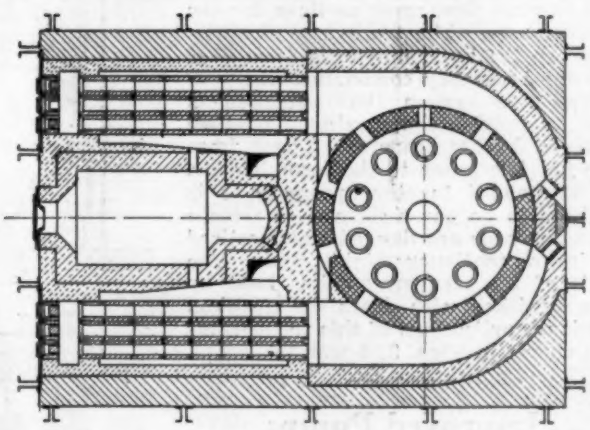


Fig. 2—Cross-Section of Hermansen Type Recuperator

The tile construction shown in Fig. 1 has here been used to form the recuperator of an ordinary gas-fired industrial furnace. As can be seen from the cut, the hot waste gases from the furnace pass out through a sole flue, pass first through the upper four flues of the recuperator and then back through the lower four, passing on out through a flue to the stack. The heat given up by these gases to the tile is absorbed by the air in transverse passages.

Fig. 3—A Ten-Pot Brass Melting Furnace With Recuperators

This furnace has a producer built in with recuperators on either side. The producer gas is burned at the bottom opening of the circular combustion chamber, the air being introduced through openings at this point. After heating the walls and roof of this chamber and also the pots that set in the indicated circle, the hot waste gases pass out through the openings in the periphery of the chamber, half passing through each recuperator and there heating the incoming air.



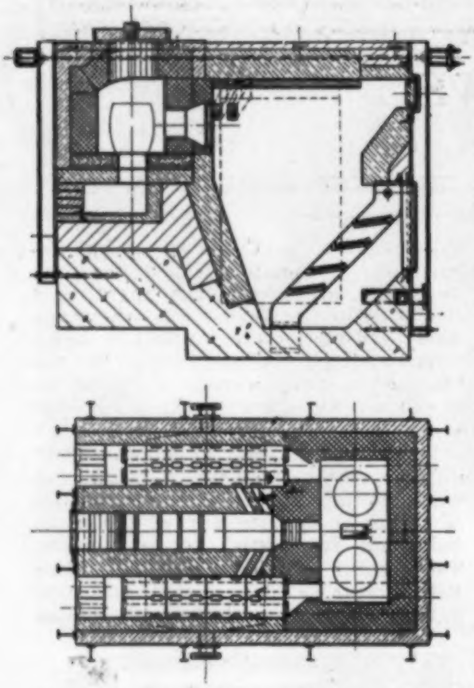


Fig. 4—A Two-Pot Brass Melting Furnace With Recuperator

This furnace is of the same general construction as that described in Fig. 3, but is designed for smaller operations.

to the incoming combustion air. It is claimed that in this way savings in the fuel wasted varying from 20 to 50 per cent can be made.

This recuperator is constructed of special refractory blocks as shown in Figs. 1 and 2. These blocks are made of a material that is claimed to be capable of withstanding extreme temperatures. They have a square bore extending from end to end and at top and bottom open-sided transverse channels. Rows or courses of these standard blocks are laid one on top of the other, forming several adjacent ducts lengthwise of the furnace that serve as flues for the waste gases. The transverse channels between the horizontal rows form flues for the secondary combustion air.

The flue system thus produced is said to provide the maximum possible surface for the transfer of heat from the hot flue gases to the incoming air. When bonded together properly it is claimed to be gas tight and to remain so. The ends are flanged and mortised to insure continuous tight joints. The ends of the recuperator thus built up are furnished with doors for cleaning. Various applications of this recuperator are shown in Figs. 3, 4 and 5.

Improved Pumps

The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has recently brought out a new line of low head centrifugal pumps, similar to the company's familiar Type "S" pumps, but embodying many improvements. Bronze companion wearing rings, L shaped, are provided to reduce disturbance in suction passages and increase efficiency. Glands are bronze, of the split, inclosed type, with drain to prevent water being thrown off or entering bearings. The stuffing box throat has bronze bushing. The shaft is of annealed steel with cast-bronze sleeves extending from runner hub to inside of bearing housing. Main bearings have split shells and two oil rings each. Dustproof oil-hole covers and oil level indicators are provided. Waterseal passages are integral with upper casing casting. Outside seal can be arranged when necessary. Shaft nuts are designed to act as oil throwers in bearings, and shaft sleeves are designed to prevent any water from creeping along shaft into bearings.

When one of these new pumps, of 5-in. size, is pumping 900 gal. per minute against a 68-ft. head, an efficiency of 80 per cent is obtained. Over a range of from 520 to 1,120 gal. per minute the efficiency is maintained above 70 per cent.

Manufacturers' Latest Publications

Vulcan Iron Works, Wilkes-Barre, Pa.—Bulletin 101. A catalog describing the Vulcan Worm Gear Drive Gasoline Locomotive, giving specifications and photographs.

Bailey Meter Co., East 46th St. and Euclid Ave., Cleveland, Ohio.—A booklet entitled "Heat Balance in the Steam Power Plant," showing how to prepare a heat balance, what readings to take and calculations to make to show in detail where various heat losses occur.

C. W. Hunt Co., West New Brighton, Staten Island, N. Y.—A booklet entitled "Report of Coke Re-screening Tests," reporting tests of the new "Mitchell" vibrating screen made at the plant of the Rochester Gas & Electric Co., Rochester, N. Y., recently.

Crouse-Hinds Co., Syracuse, N. Y.—Bulletin 2064. A bulletin describing the "Imperial" floodlight projectors for plant yard lighting, etc.

Bernitz Furnace Appliance Co., 177 State St., Boston, Mass.—Bulletin W. G. A pamphlet describing the Bernitz "Super Block," a refractory lining block of carborundum for water gas generators.

Robins Conveying Belt Co., 15 Park Row, New York.—Bulletin 64. A bulletin describing the Robins "Bronco" and "Perfex" vibrating screens and the "Cataract" grizzlies.

P. H. & F. M. Roots Co., Connersville, Ind.—A leaflet describing the Roots Positive Displacement Gas Meter.

Robertshaw Manufacturing Co., Youngwood, Pa.—Catalog 3. A catalog describing and illustrating the use of Robertshaw automatic temperature controllers for industrial applications.

Connersville Blower Co., Connersville, Ind.—Bulletin 4B. A catalog describing the Connersville improved Rotary Displacement Meter for measuring gaseous flow.

A. F. Craig & Co., Ltd., Paisley, Scotland.—A bulletin describing the new type "Alanmor" Parraffin Wax Sweating Stove for petroleum refineries.

Griscom-Russell Co., 90 West St., New York.—Form 201. A leaflet describing the twin "Multiwhirl" heat exchanger and the twin "Vaneflo" heat exchanger, primarily designed for use with oils.

American Schaeffer & Budenberg Corporation, Berry & South 5th St., Brooklyn, N. Y.—Bulletin 1700. A bulletin describing the new "Columbia" strip chart recorder for temperatures and pressures.

Crouse-Hinds Co., Syracuse, N. Y.—Folder 20. A folder describing safety switch condulets of the tumbler and quick make and break types, both waterproof and non-waterproof.

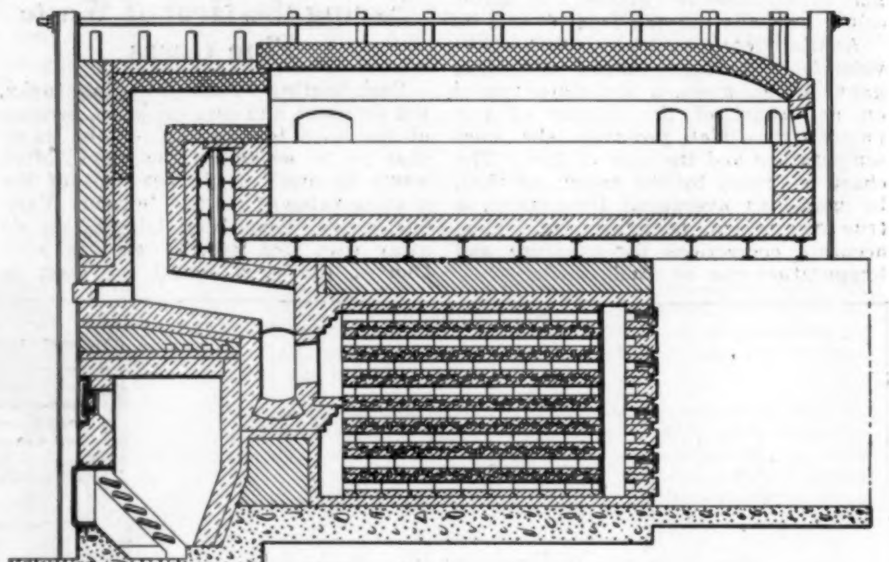


Fig. 5—Application of the Hermansen Recuperator to a Glass Tank Furnace

Like the brass furnace of Fig. 3, this tank is fired by the gas from a built-in producer, there being four recuperators provided for recovering the heat of the waste gases. This type of construction is much more compact than usual Siemens type regenerators used in connection with glass tank furnaces.

Bureau of Mines Solves Important Problems in Oil Production

At the Richland field, one of the newer oil-producing districts in Texas, some of the wells have been drilled into a water-bearing sand which threatened to cut off the supply of oil. After a careful study of the well logs, field conditions and operating data, engineers of the Bureau of Mines were able, in but 2 weeks time, to provide maps and underground cross-sections which enabled the operators to check the flow of intruding water.

In the Powell field, also in Texas, twenty-nine wells have been cemented under the direction of Bureau of Mines engineers. Twenty-two of these wells have been tested, the results showing that water has practically been excluded. The average daily production of the wells has been increased from 800 to 6,000 barrels. This type of repair work, based entirely on an engineering study of the field, has been greatly facilitated because of recent improvements in the tubing method of cementing. As a result, the time of shut-down for repairs has been reduced from 10 or 12 days to only 4 days.

Other problems of operation that have been studied are the application of vacuum to oil wells, the use of compressed air, and the water drive. A decision as to the correct method of operation must be founded upon the costs involved, says the report. If the financial gain through increased oil and gas production is greater than the additional expense incurred, the change is justified.

North Carolina to Give Correspondence Courses in Ceramics

North Carolina State College of Agriculture and Engineering is offering correspondence courses in ceramic engineering. The course will be given by Prof. A. F. Greaves-Walker, and is open to residents of all states.

Extent of U. S. Interests in New Brunswick Pulpwood Industry

The Province of New Brunswick, Canada, has during the past 3 years exported to the United States much more pulpwood than it has consumed in pulp or paper manufacture at home. At the present time it is quite likely that the amount of New Brunswick's pulpwood that is manufactured into the finished product in mills within the province is greater than the amount that has been exported, but this is only a recent growth.

About one-third of the land that is owned outright by various companies and individuals is in the hands of United States interests. This amounts to about 1,300 square miles. In addition to this American interests in licensed lands in the province are very heavy.

The Royal Commission on pulpwood, which recently made its report to the government, reported that a beginning had been made in the manufacture of paper in the province, and the increased production awaited only more adequate supply of power.

U. S. Patents Issued Nov. 25, 1924

Machine for Treating Rubber and Other Heavy Plastic Material. Fernley H. Banbury, Ansonia, Conn., assignor to Birmingham Iron Foundry, Derby, Conn. — 1,516,488.

Manufacture of Products From Starch. Richard W. G. Stutzke, Cedar Rapids, Iowa, assignor to Douglas Co., Cedar Rapids, Iowa.—1,516,512.

Manufacture of Sodium Nitrate. Elias Anthon Cappelen Smith, New York, N. Y., assignor to Guggenheim Bros., New York. —1,516,550.

Cement or Waterproof Glue Material and Process of Preparing or Manufacturing the Same. Henry L. Haskell, Ludington, Mich., assignor to Haskelite Mfg. Corp., Grand Rapids, Mich.—1,516,567.

Process of Making Oxides of Nitrogen and Caustic Alkali. Donald B. Bradner, Edgewood, Md.—1,516,588.

Method of and Apparatus for Pulp Washing. Harold R. Eyrich, Chicago, Ill., assignor to the Paper De-Inking Co., Chicago, Ill.—1,516,593.

Hot Plate for Vulcanizing Presses. John R. Gammeter, Akron, O., assignor to the B. F. Goodrich Co., New York, N. Y. — 1,516,596.

Printing Sheet Rubber. Richard T. Griffiths, Akron, O., assignor to the Miller Rubber Co., Akron.—1,516,598.

Retort-Arch Construction. Louis H. Hosbein, Chicago, Ill., assignor to M. H. Detrich Co., Chicago.—1,516,604.

Method and Machine for Making Laminated Articles. Frank J. MacDonald, Akron, O., assignor to the B. F. Goodrich Co. New York, N. Y.—1,516,613.

Method of Vulcanizing Rubber Composition. Ernest Blaker, Akron, O., assignor to the B. F. Goodrich Co., New York, N. Y.—1,516,629.

Method of Making Dry Cells. Harold De Olaneta, New Haven, Conn., assignor to Winchester Repeating Arms Co., New Haven.—1,516,632.

Tanning. William H. Ockleston, Bourn, and Thomas Burnell Carmichael, Waterloo, near Liverpool, England.—1,516,641.

Method of Annealing and Apparatus Therefor. Ture Gustaf Rennerfelt, New York, N. Y.—1,516,645.

Process for the Production of Zinc in Electric Furnaces. Filip Tharaldsen, Christiania, Norway.—1,516,651.

Apparatus for Drying Sheets of Edible Gelatin. William Keir Beveridge, Warwick, England, assignor to George Nelson, Dale & Co., Warwick, England.—1,516,663.

Destructive Distillation of Corncobs. Thomas K. Bernston, deceased, late of Pittsburgh, Pa., by Lillian Bernston, executrix, Pittsburgh, Pa., assignor, by mesne assignments, to John W. Garland, Inc., Pittsburgh.—1,516,701.

Thickening Filter. David M. Berry, Oakland, Calif.—1,516,702.

Process of Treating Petroleum Products. Carleton Ellis, Montclair, N. J., assignor to Ellis-Foster Co., Montclair.—1,516,720.

Meat-Curing Method and Apparatus. Dwight Bradford Hill, Winchester, Mass.—1,516,728.

Producing Aromatic Substances From Petroleum. Harry M. Weber, Bloomfield, N. J., assignor to Ellis-Foster Co., Montclair, N. J.—1,516,756.

Fuel Mixture Containing Oxidized Petroleum Products. Harry M. Weber, Caldwell, N. J., assignor to Ellis-Foster Co., Montclair, N. J.—1,516,757.

Soldering Material. Spors Woolums, Detroit, Mich.—1,516,759.

Paper-Interfolding Machine. James A. Nichol, Green Bay, Wis., assignor of one-half to Joseph L. Hoslett and one-sixth to John T. Neugent, both of Green Bay, Wis. —1,516,779.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met," readers. Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Process for Treating Calcium Carbide. George J. Ferguson, Philipsburg, Pa.—1,516,813.

Liquid-Level Gage. Alexander K. Schaap, Jr., Brooklyn, N. Y.—1,516,829.

Antifriction Support for Pipe Lines. Stanfield N. Arnold, Plainfield, and Francis E. Johnson, Jr., East Orange, N. J., assignors to the M. W. Kellogg Co., Del.—1,516,838.

Machine for Making Articles of Plastic Compounds of Different Colors. Alfred C. Buttfield, Butler, N. J., assignor to American Hard Rubber Co., New York, N. Y.—1,516,841-3.

Cutting-Oil Compound and Process of Making the Same. Fred K. Bezzenberger, East Cleveland, O., assignor to Ray S. Gehr, trustee, Cleveland, O.—1,516,879.

Absolute Methyl Alcohol in Motor Fuel. Arthur A. Backhaus, Baltimore, Md., assignor to U. S. Industrial Alcohol Co., W. Va.—1,516,907.

Device for the Handling of Molten Lead, Tin, Babbitt and Other Metals or Materials. Gilbert Richard Coleman, Jersey City, N. J.—1,516,912.

Rotary Grinding Machine. Harro Cramm, Neukolln, Germany.—1,516,913.

Process for Extracting Sulphur From Gases Containing Sulphureted Hydrogen. Marie Charles Joseph Elisee De Loisy, Paris, France, assignor to Augustin Amedee Louis Joseph Damiens, Arcueil-Cachan, France, to himself, and to Olivier Joseph Gislain Piette, Brussels, Belgium. — 1,516,915.

Process of Treating Seaweed. Paul Theodore Freundler, Paris, France. — 1,516,917.

Electric Battery. William R. Loveman, Bridgeport, Conn., assignor to the Bridgeport Metal Goods Mfg. Co., Bridgeport. —1,516,974.

Pharmaceutical Compound Containing the Sodium-Silver Compound of Thiodiglycolic Acid. Hans Hahl and Hermann Weyland, Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.—1,517,002.

Pharmaceutical Compound Consisting of the Sodium-Vanadium Salt of Triglycollamic Acid. Hans Hahl and Walter Kropp, Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.—1,517,003.

Paper-Making Machine. Charles R. Seaborne, Niagara Falls, N. Y., assignor, by mesne assignments, to American Lakes Paper Co., Waukegan, Ill.—1,517,018.

Controlling or Recording System. Edgar A. Ulmann, San Francisco, Calif., assignor to C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. —1,517,031.

Roller for Pressing Apparatus for Wood Pulp and Cellulose. Rudolf Ernst Wagner, Karlstad, Sweden, assignor to Aktiebolaget Karlstads Mekaniska Verkstad, Karlstad, Sweden.—1,517,036.

Method and Process for the Leaching of Caliche and for the Recovery of Nitrate Therefrom. Charles Lalor Burdick, New York, N. Y.—1,517,046.

Method of Preparing Metal Borings and the Like Particularly for Use in Furnaces. Thomas Gilmore, Jr., Brooklyn, N. Y., assignor to the General Metal Briquette Corp., New York, N. Y.—1,517,055.

Process for Making Emulsified Compositions. Lester Kirschbraun, Chicago, Ill.—1,517,075.

Metallic Head for Wooden Kegs and the Like. George Eugene Mittinger, Cleveland.—1,517,087.

Electric Furnace—Arturo Paolonin, Baden, Switzerland, assignor, by mesne assignments, to the Firma Motor-Columbus Aktiengesellschaft für Elektrische Unternehmungen, Baden, Switzerland.—1,517,122.

Muffle Furnace for Heat-Treatment of Steel. Albert Edward Rudd, Wolverhampton, England.—1,517,172.

Furnace. Lee Coy Fountain, Kingsburg, S. C.—1,517,206.

Process of Reclaiming Rubber Materials and the Product. George J. Mead, Chicago, Ill., and Clement A. Rossbach, Milwaukee, Wis., assignors to the Fisk Rubber Co., Chicopee Falls, Mass.—1,517,221.

News of the Industry

Summary of the Week

Proposed federal budget gives $200,000 increase in appropriation to the Chemical Warfare Service.

Code of standard practice is adopted by the American Institute of Steel Construction.

Senator Underwood proposes plan to dispose of Muscle Shoals controversy, but Senate receives it coldly.

Negotiations concluded for $6,000,000 American loan to tide over German potash industry.

American Society of Mechanical Engineers, meeting in New York, discusses fuel oil problems.

Official figures report material gain in export and import trade in chemicals for October.

Senator Cummins made chairman of Judiciary Committee of the Senate.

American Institute of Chemical Engineers holds successful meeting in Pittsburgh.

Underwood's Muscle Shoals Proposal Meets Opposition

WHEN the Senate, in conformity with its agreement at the last session, took up the Muscle Shoals bill on Dec. 3, consideration of the measure was deferred by unanimous consent. In the discussion the President of the Senate raised the question as to whether or not, under the terms of the agreement, the measure could be displaced by other business. While the discussion revealed that it was the consensus that the measure could be displaced by unanimous consent, the emphasis placed by the President on the requirement for final disposition leads to the belief that the chair would not countenance the simple recommitment of the matter to the Agricultural Committee. Apparently the agreement requires that the Senate legislate on the matter. Before that is done it is certain that considerable discussion will ensue with the probabilities indicating that the administration, in the meantime, will adopt a more concrete policy than was outlined in the President's message.

> Senator Underwood states that sight frequently is lost of the fact that the government undertook the Muscle Shoals project for the purpose of fixing nitrogen for use in explosives in time of war and for use in fertilizers in time of peace. Since this is the main purpose of the development, he refuses to consider any other use of the properties until provision has been made for the manufacture of nitrogen in substantial quantities.

Proposal Not Acceptable

It is very apparent that the bill proposed by Senator Underwood as a substitute for the measure now before the Senate is not acceptable to a large proportion of its membership. It violates several principles for which the majority party stood during the recent campaign. There is no reason to believe the Senate will approve of either government ownership or the subsidizing of fertilizer manufacture.

One of the flaws in the Underwood bill is that no provision is made for the surplus power after the needs for fertilizer manufacture have been met. The requirement that 10,000 tons of nitrogen be fixed the first year, 20,000 tons the second, 30,000 tons the third, and thereafter 40,000 tons each year is a very drastic provision and in striking contrast with the comparable provision in the Ford offer. The requirement that the licensee pay 4 per cent on the total cost is more than the return would have been under the Ford offer.

There is certain to be strong opposition to any plan that might result in placing the surplus power at the disposal of the fertilizer manufacturer who might utilize it on the ground to make aluminum, manufacture chemicals or something else and prevent its distribution. There is very strong sentiment in the Senate to the effect that any surplus not required for fertilizer purposes should go for public utility use.

Farm Bureau Backs Underwood

Senator Underwood's bill has the backing of the American Farm Bureau Federation, which wields much political power, and the proponents of the Ford offer generally. In a formal statement the Farm Bureau Federation declares the Underwood bill "makes for action." "It contains the fertilizer provision of the Ford offer," continues the statement, "and of course that is one of the main contentions of the farmers. It does not shunt the bill to another investigating committee — Congressional or otherwise—and keeps the fight in the open. It also assures the public that the power will not be turned over to a power company to distribute. Should there be no offer by July next which would approximate the conditions laid down in the Underwood bill, such as the manufacture of 40,000 lb. of nitrogen to be made into high-grade fertilizer, according to demand, then the government operation exponents would have their ideas carried out through the formation by President Coolidge of a $50,000,000 government corporation which would operate to produce fertilizer on the same cheap basis as carried in the Henry Ford tender."

President Coolidge's Recommendations

Apparently the Farm Bureau Federation does not agree with the proposal in the President's message that "a subcommittee of the committees on agriculture should investigate this field and negotiate with prospective purchasers." In his reference to Muscle Shoals the President also said: "Much costly experimentation is necessary to produce commercial nitrogen. For that reason it is a field better suited to private enterprise than to government operation. I should favor a sale of this property, or a long-time lease under rigid guarantees of commercial nitrogen production at reasonable prices for agricultural use. There would be a surplus of power for many years over any possibility of its application to a developing manufacture of nitrogen. It may be found advantageous to dispose of the right to surplus power separately with such reservations as will allow its gradual withdrawal and application to nitrogen manufacture."

Pittsburgh's Industries Interest Chemical Engineers

Seventeenth Annual Meeting of Institute Hears Papers Outlining the Chemical Engineering Activities of the District and Inspects Plants

THE seventeenth annual meeting of the American Institute of Chemical Engineers was held last week in Pittsburgh, Pa., with headquarters at the Hotel Schenley. The local committees under E. R. Weidlein, director of the Mellon Institute, and J. H. James of Carnegie Tech, prepared an unusually attractive program, which took advantage of the unusual diversity of Pittsburgh's industries on the industrial trips and painted a graphic picture of them in a series of papers that were presented.

E. R. Weidlein first outlined the chemical and engineering activities of the district. Not only industries, with steel, glass, coke, refractories and even radium, but research, with Mellon Institute, Carnegie Tech and the University of Pittsburgh, is ably represented. This outline was followed by a description of the field and laboratory work of the Bureau of Mines at the Pittsburgh station by A. C. Fieldner. The chemical engineer's role in the development of electrical machinery as represented by the Westinghouse company was discussed by David R. Kellogg. Problems of insulators, lubricators, filament lamps and many other things have demanded and are demanding the close co-operation of the chemist, the chemical engineer and the electrical engineer.

This series of papers was continued by W. F. Rittman, who discussed the Pittsburgh district as a power center, and by H. B. Miller with a paper on smoke regulation, of which Pittsburgh had great need. These and the other technical papers will be abstracted in next week's issue.

The Trips to Industries

An inspection of the Mellon Institute, the Bureau of Mines and Carnegie Tech was a good start for the field work. A bewildering array of options confronted the members next day. Torn between a glass plant, a steel plant, a storage battery unit, the Westinghouse company, "57 Varieties" and firebrick, the crowd made roughly an even split. The next day everyone took the all-day excursion to the American Steel & Wire Co. plant at Donora, where everything from acid to nails and wire is produced. The afternoon brought the special train to the immense Clairton Byproduct Works of the Carnegie Steel Co.

A dinner, not a banquet—that was what the committee promised, and it would have to be a matter of definition whether they kept their promise. A number of vaudeville stunts, put on by Carnegie Tech students, enlivened the evening and increased the high esteem that the members had for the Carnegie Drama School after its performance of "A Pair of Spectacles."

Charles L. Reese was re-elected president of the society and the vice-presidents, H. K. Moore, H. G. Miner and A. H. White, automatically retained office. Secretary Olsen, Treasurer Frerichs and Auditor Wesson were also returned to office. H. C. Parmelee, E. R. Weidlein and F. C. Zeisberg were elected councilors for 3 years.

American Loan to Tide Over German Potash Industry

According to advices from abroad, negotiations have been concluded whereby the German Potash Syndicate receives a loan of $6,000,000 from America, through the Chase National Bank and the International Acceptance Co. This loan is for current operation during the present period of money tightness and credit shortage and not for extensions. As security the Potash Syndicate offers stocks in warehouse and in transit to America. The Syndicate denies that the Franco-German treaty had anything to do with facilitating these credit negotiations, contrary to statements in the German press.

There are 221 potential potash shafts in Germany. Fifty-two of these have been closed down voluntarily as unprofitable, under the so-called "closing down law." This is about one-fourth of all potential operations. When the German potash business was in very poor shape last summer, there were only 50 shafts operating. At present writing (Oct. 27, 1924) there are 78 producing, as business has revived in the last few weeks.

As a matter of fact, the improvement in September was so great that more shafts would have been reopened except that considerable stocks accumulated during the summer had to be thrown on the market. September sales are said to have reached about 125,000 tons K_2O, or only about 25,000 tons less than their level in September, 1913, when the Alsace mines were German. October sales will probably fall to 75,000 tons K_2O, as domestic sales ordinarily decline at this season and export is the chief activity.

The closing down of the potash shafts works out more or less automatically. When a shaft's operating costs do not permit profit under the inflated prices fixed by the "Reichskalirat," it must necessarily cease operations. The production quotas of these unproductive shafts are bought up by other productive enterprises, generally in competition with one another. Thus, the unproductive shafts are partly compensated and are generally permanently closed down.

Canadian Exports of Pulp and Paper Show Decrease

The value of pulp and paper exported from Canada during the first 10 months of this year was $114,699,119, a decrease of $2,227,569 compared with the corresponding period last year.

News in Brief

Meeting of the New Jersey Special Agents Association — The New Jersey Special Agents Association of the National Fire Protection Association will meet on Dec. 8 at 12:30 p.m. at the Newark Athletic Club, Newark, N. J.

Important Development in Canadian Paper Industry — Price Bros. & Co., Ltd., announces that in line with the program of expansion planned by the late Sir William Price, construction will be started immediately on a 200-ton per day newsprint mill at St. Joseph D'Alma, near the Duke-Price power development on the Grande Discharge.

Third Report on Contact Catalysis Now Available—The third report of the National Research Council committee on contact catalysis has been prepared by Dr. Hugh S. Taylor. The author states that the report aims to be a summary of recent developments on the mechanism and general technique of contact catalysis. Reprints of the report may be obtained from the National Research Council.

American Association of the Advancement of Science to Meet in Washington—The fifth Washington meeting of the American Association for the Advancement of Science will be held Dec. 29 to Jan. 3. Those expecting to attend should arrange for accommodations immediately.

Plans for Japanese-German Commercial Treaty—Reports were received last week to the effect that Japan and Germany had opened negotiations for the formation of a commercial treaty. The greatest effect of this treaty is expected to be in the removal of the Japanese embargo on German dyes.

Steel Construction Institute Adopts Standard Code

Adoption of the code of standard practice and plans for the publication of an authoritative handbook for the structural steel industry were prominent features of the convention of the American Institute of Steel Construction held at French Lick, Ind., on Nov. 13, 14 and 15. The code of standard practice has been pronounced by engineers as being the most complete code of its kind in any industry. The Institute was told at the convention that the standard specification has been written into the building codes of twenty-five cities, and that its influences are being felt throughout the country. Reports on the progress of the Institute during the past year were presented by J. L. Kimbrough, president; Charles F. Abbott, executive director, and Lee H. Miller, chief engineer of the Institute. Among the addresses delivered before the convention were the following:

"Benefits of a Uniform Method of Cost Accounting," by William R. Bassett, president, Miller, Franklin, Bassett & Co., New York; "Basic Principles to Be Considered in Fireproofing Structural Steel," by A. W. Sinnamon, chief engineer, Hubbell & Benes, Cleveland, Ohio.

Washington News

Senator Ernst Continues to Head Patents Committee

In the rearrangement of committee assignments in the Senate no change was made in the chairmanship of the Patents Committee. Senator Ernst, of Kentucky, will continue in that chairmanship. He had been considered for other assignments that would have necessitated the surrender of the Patents chairmanship. These plans, however, did not materialize. This is of particular importance, since Senator Ernst is known to be in full sympathy with the plans of the Interdepartmental Patents Board to secure prompt consideration of its legislative program dealing with the handling of government patents.

The new Senators from Massachusetts and Rhode Island, Messrs. Butler and Metcalf, have been designated to fill the vacancies on the Patents Committee.

Fourteenth Supplemental List of Dye Standards

The Treasury Department has issued its fourteenth supplemental list of standards of strengths of dyes for the purpose of assessing the specific duty of 7c. per lb. on coal-tar colors, which is applied in the ratio that the strength of the importation bears to the strength of similar commercial imports prior to July 1, 1914. The fourteenth supplemental list adds eleven dyes to the standards, names twelve others for similitude to dyes previously listed and makes four corrections in previous lists.

Spanish Hydro-Electric Plant to Expand Operations

The powerful Sociedad Electro-Quimica de Flix, engaged in the manufacture of chloride of lime in the Province of Tarragona, Spain, has decided to take up on a large scale the manufacture of explosives and sulphate of ammonia, Frank A. Henry, American Consul at Barcelona, reports. The company operates a hydro-electric plant on the Ebro River. The Consul states that the nitrogen is to be obtained from the atmosphere, but does not mention the process to be employed.

Cummins Heads Committee in Charge of Cramton Bill

Senator Cummins of Iowa has been chosen as the new chairman of the Judiciary Comittee of the Senate. This selection has been awaited with unusual interest because of the fight raging around the Cramton bill, which provides for the establishment of a separate bureau of prohibition in the Treasury Department and vests in the head of that bureau the authority over industrial alcohol which now is exercised by the Comissioner of Internal Revenue.

The appointment of Senator Cummins to this chairmanship is regarded as an advantage for those who oppose the Cramton bill. While he has supported prohibition legislation throughout his service in Washington, he did oppose what he regarded as ill-advised prohibition legislation in Iowa and has given throughout abundant evidence of not being a fanatical dry. For this reason it is believed he will favor further consideration of the Cramton bill by the Judiciary Comittee of the Senate. The support of the chairman of the committee is regarded as essential to the securing of the recommitment of the bill, which was rushed on to the Senate calendar without committee consideration in the closing hours of the last session.

Larger Foreign Trade in Chemicals in October

Export Shipments Show Large Gain Over September Totals—Imports Also Are Larger

Imports of chemicals during October increased decidedly. The free list total for October was $6,798,083. This is nearly $1,300,000 greater than the import movement of duty-free chemicals in September. The value of dutiable chemicals imported in October aggregated $3,138,234. This is an increase of nearly $600,000 over September.

The increase of imports of coal-tar chemicals was even on a larger scale than the general increase. During October coal-tar products to the value of $1,376,468 were brought into the country. Imports of creosote oil were one-third greater in October than in September, which is mainly responsible for the upturn. Colors, dyes and stains added materially to the total. Imports of fertilizer in October totaled 172,517 tons, or 30,000 tons in excess of the September importations. A similar increase was registered in receipts of foreign paints, pigments and varnishes. The October total was $239,171.

The detailed comparative figures covering certain imports are as follows:

	Oct., 1923	1924
White arsenic, lb.	1,393,368	1,304,872
Citric acid, lb.	83,075	6,720
Formic acid, lb.	66,053	99,242
Oxalic acid, lb.	186,809	276,500
Copper sulphate, lb.	....	128,400
Carbonate potash, lb.	449,026	217,260
Hydroxide potash, lb.	670,146	1,677,878
Chlorate potash, lb.	....	619,780
Sodium cyanide, lb.	2,053,420	1,791,700
Ferro cyanide, lb.	78,778	379,302
Sodium nitrite, lb.	78,537	233,403
Nitrate of soda, tons	56,788	70,450
Creosote oil, gal.	9,930,939	5,056,808
Naphthalene, lb.	734,598	220

Exports of chemicals also turned upward. The October figures show that $10,068,059 worth of chemicals were sent out of the country in that month. This is a million and a half in excess of the value of chemicals exported in September. Of that total coal-tar products furnished $751,831. Exports of soda and sodium compounds totaled 27,782,784 lb., which exceeded the September figures by 700,000 lb. and those of October, 1923, by nearly as much. Exports of fertilizer passed the 100,000-ton mark and exceeded those of September by 25,000 tons. The movement of phosphate rock was chiefly responsible for the increase, although forwardings of sulphate of ammonia also were large.

Exports of explosives continued in October at about the same volume as September, the figure being 1,804,890 lb. Pigments, paints and varnishes had an October total of $1,200,657, which is an increase over the September figure, but does not quite equal the figure for October of 1923. Certain comparative figures follow:

	Oct., 1923	1924
Benzol, lb.	9,046,866	17,165
Sulphuric acid, lb.	356,297	848,686
Acetate of lime, lb.	336,000	1,367,416
Bleaching powder, lb.	2,616,974	1,942,370
Chlorate of potash, lb.	11,201	36,564
Bichromate potash, lb.	307,690	56,187
Soda cyanide, lb.	246,740	34,580
Soda ash, lb.	2,348,273	3,474,914
Caustic soda, lb.	7,498,635	8,742,418
Sulphate of ammonia, tons	10,735	10,974

All of the foregoing figures are those of the Department of Commerce compiled from the returns from all ports of entry.

Dr. Ittner Refutes Charge of Wide Alcohol Diversion

In reply to a statement made by Wayne B. Wheeler that 6,000,000 gal. of alcohol released by the Bureau of Internal Revenue is being diverted every year to illegitimate use, Dr. Martin H. Ittner, chairman of the committee on industrial alcohol of the American Chemical Society, has issued a statement in which he says that no evidence of an acceptable nature has been given to support such a charge. Dr. Ittner stated that it was very little harder to get a permit for purchasing pure alcohol than to get one for the purpose of denatured that might be rectified, if one grafts in the right direction, and it is much safer. He also stated that there were very few formulas for denatured alcohol which it would be at all profitable to rectify for beverage purposes.

Secretary Work Outlines Activities of Bureau of Mines

In his annual report made public on Dec. 2, Secretary of the Interior Work outlined the oustanding achievements of the Bureau of Mines during the past year. Special efforts have been made to increase safety in mining, research being directed along three main lines:

1. Co-operation with the British Mines Department, whereby the results of British experiments and research directed toward greater safety in mining will be available to American engineers, and the results of Bureau of Mines studies will be available to the British. This will, in effect, double the research possibilities of both countries without increasing the cost.

2. An intensive effort for the adoption of rock dusting as a means of preventing disastrous explosions in bituminous coal mines.

3. A study of coal mining hazards, with special reference to further research on the safe use of electricity in mines.

The technical staff of the Bureau of Mines also has been of assistance in the production of helium, co-operating with the Army and Navy Helium Board in its efforts to locate and conserve sources of this vital element of national defense.

Federal Budget Allows Increase to Chemical Warfare Service

Nearly $200,000 Added to Appropriation for Next Fiscal Year—Bureau of Chemistry Gets $1,500,000—Figures for Other Bureaus

THE budget for the next fiscal year carries $904,400 for the Chemical Warfare Service. This is nearly $200,000 larger than the amount actually appropriated for the work of the Service during the current fiscal year. Of the total asked it is proposed to expend $775,060 for personal services. For supplies and materials, $98,500 is asked; for travel expenses, $2,500; for transportation of materials, $1,500; for rent, $1,840; for repairs and alterations, $25,000.

The budget carries $1,498,328 for the Bureau of Chemistry. It is subdivided as follows: personal services in the District of Columbia, $362,208; for investigations relating to the application of chemistry to agriculture, $123,400; chemical investigations for other departments, $14,090; for investigation in the utilization, for coloring, medicinal and technical purposes of raw materials produced in the United States, $54,805; for the investigation and development of methods for the manufacture of table sirup and sugar by the utilization of new agricultural sources, $28,000; for carrying into effect the provisions of the pure food and drug act, $790,000; for the prevention of imports of impure tea, $40,690; for the investigation and development of methods of manufacturing insecticides and fungicides, and for investigating chemical problems relating to their composition and action, $27,580; for the investigation and development of methods for the prevention of grain dust and other plant dust explosions, $26,555; for the investigation and demonstration of improved methods or processes of preparing naval stores, $30,000; for chemical apparatus and supplies, $123,400.

The Bureau of Soils proposes to expend $30,640 for chemical investigations of soil composition and $15,145 for physical investigations of soil properties. For the investigation of fertilizers, the budget carries $63,595.

Department of Commerce Budget Less

The budget carries $22,741,514 for the work of the Department of Commerce during the next fiscal year. This is $1,200,000 less than the amount actually appropriated for the department for the present fiscal year. The total is made up as follows: office of Secretary, $230,380; contingent expenses, $200,000; rent, $68,000; printing and binding, $500,000; Bureau of Foreign and Domestic Commerce, $2,914,864; Bureau of the Census, $1,974,000; Steamboat Inspection Service, $1,057,470; Bureau of Navigation, $526,240; Bureau of Standards, $1,750,410; Bureau of Lighthouses, $9,677,980; Coast and Geodetic Survey, $2,298,230; Bureau of Fisheries, $1,543,940.

The subdivisions of the budget for the Bureau of Foreign and Domestic Commerce are as follows: for commercial attachés, $315,861; for promoting commerce in Europe, $432,600; for district officers, $215,818; for promoting commerce in South and Central America, $248,040; for promoting commerce in the Far East, $243,734; for the enforcement of the China trade act, $30,000; for export industries, $618,054; raw material investigations, $75,800; for compiling customs statistics, $339,980; for preparing lists of foreign buyers, $12,000; investigating sources of crude rubber, $50,000; investigation of foreign trade restrictions, $30,000; for personal services in the District of Columbia, $266,477.

Bureau of Standards to Concentrate on Building Materials

The budget for the Bureau of Standards is subdivided as follows: for personal services in the District of Columbia, $511,760; for apparatus, $70,000; for fuel, heat, light and power, $43,500; improvement of grounds, $11,000; for the continuation of the investigation of structural materials, $230,000; for the maintenance and operation of testing machines, $38,000; for the investigation of fire-resisting properties of building materials, $28,100; for the investigation of public utilities standards, $100,000; for testing varnish and soap materials and chemicals, $44,090; for radio research, $44,800; for the development of color standards, $9,000; for the study of technical processes used in the manufacture of clay products, $27,000; for standardizing mechanical appliances, $27,800; for investigations of optical glass, $20,520; for the investigation of textiles, paper, leather and rubber, $26,560; for the design of sugar-testing apparatus, and the development of technical specifications for sugar, $38,160; for gage standardization, $38,320; for the investigation in mine scales and cars, $14,540; for metallurgical research, $43,140; for high-temperature investigations, $9,740; for the investigation of the principles of sound, $5,580; for industrial research, $174,120; for testing railroad scales, $39,000; for the standardization of electrical and mechanical devices, and other equipment, $110,000; for standard materials to be used in checking chemical analyses, $10,000; for the investigation of radio-active substances, $10,680; for investigations of automotive engines, $25,000.

Carnegie Tech Awards Fellowships

Fellowships in metallurgical engineering at the Carnegie Institute of Technology for the current semester have been awarded to Ernest N. Bauer, Butler, Pa.; Joseph W. Campbell, Duquesne, Pa.; Wayne L. Cockrell, Dayton, Ohio, and Herbert S. Karch, Norwood, Ohio. John A. Robb, Millersburg, Pa., has been awarded a fellowship in chemical engineering.

Engineers Discuss Fuel Oil Problems

Annual Meeting of the A.S.M.E. Develops Many Points Helpful to the Industries Using Petroleum

Several thousand engineers and industrialists gathered in New York City from Dec. 1 to 4 for an inspiring and profitable annual meeting of the American Society of Mechanical Engineers, held at the society's rooms in the Engineering Societies Building. The annual elections were held at this time and the new officers are: President, Dr. William F. Durand; vice-president, Thomas L. Wilkinson; vice-president, Sherwood F. Jeter; vice-president, Prof. Robert W. Angus; secretary, Calvin W. Rice; treasurer, William H. Wiley.

Among the special features of the meeting were an informal get-together on Dec. 1 at which Anton Goetze of Germany spoke on the new Flettner Rotor Ship; a lecture by Dr. Julian D. Sears of the U. S. Geological Survey, Washington, D. C., on the American Petroleum Situation, carrying a strong plea for the more efficient use of all oil products; a session of national defense at which Dwight F. Davis, Assistant Secretary of War, detailed the scheme of organization through which the government plans to utilize the man power of the country to the full in case of another war; and a celebration of the Carnot Centenary, held on the evening of Dec. 4, at which time Dr. Michael I. Pupin spoke on Carnot's Principle and Dr. William Leroy Emmet discussed Carnot's influence upon engineering.

The Technical Sessions

The technical sessions were, as usual, the heart of the meeting. This year the high spot, in so far as the process industries are concerned, was the exhaustive consideration given to petroleum. Commander H. G. Donald, chief of the U. S. N. Fuel-Oil Testing Plant at Philadelphia, detailed the navy's experience with oil as a fuel. N. E. Lewis, Babcock & Wilcox Co., told of current practice in oil firing in industrial and central stations, pointing particularly to the need of better refractories for lining the furnaces of oil-heated equipment, refractories that will give as good results at a reasonable price as do special refractories at very high prices today. H. E. Newall, of the National Board of Fire Underwriters, gave a paper on the hazards of industrial oil burning in which some interesting figures were given as to the causes of fires in oil-burning installations, as follows:

	Per Cent
Broken pipes	26.5
Broken and defective fittings and valves	11.7
Carelessness with valves	10.8
Overheated oil furnaces	6.9
Miscellaneous carelessness	6.9
Broken burners and connections	4.9
Leaking pipes	4.9
Sparks or flames from furnaces	4.9
Explosions in furnaces	3.9
Clogging of pipes or burners	3.9
Oil getting into air pipes	2.9
Defective or improperly installed tanks	2.9
Explosions in tanks	2.0
Oil soot ignited in flue	1.0
Data lacking	6.9
	100

Men You Should Know About

Dr. LEO H. BAEKELAND, president of the American Chemical Society, gave an instructive address before the members of the Pittsburgh, Pa., section of the society Nov. 21, dealing with the subject of "Misdirected Energy" and reviewing briefly the history of the rise of the chemical profession.

JOHN D. CARBERRY has retired as assistant secretary and assistant treasurer of the United States Rubber Co., New York, after a continuous service of 32 years. He was elected assistant secretary in 1903 and shortly afterward assistant treasurer, also becoming an active director and officer of the different subsidiary and affiliated organizations.

H. C. GEORGE, petroleum engineer of the Department of the Interior, who has been in charge of the Ardmore, Okla., field office of the Bureau of Mines, has resigned to accept a position as the director of petroleum engineering at the University of Oklahoma. Mr. George has been succeeded by FRANK M. BREWSTER, formerly assistant deputy supervisor at the Taft, Calif., office of the Bureau of Mines, who will conduct the work of studying development problems in the southern Oklahoma oil fields.

A. F. GREAVES-WALKER of Raleigh, N. C., has been appointed consulting refractories engineer for the United States Bureau of Mines. He will cooperate with engineers from the Columbus section of the bureau now engaged in investigating the refractories requirements of large steam power stations. Mr. Greaves-Walker recently became head of the ceramics department of the North Carolina State College at Raleigh.

F. D. HARGER, mechanical engineer, for many years connected with the Mono Corporation of America and more recently with the C. J. Tagliabue Manufacturing Co., Brooklyn, has accepted a position as sales manager and supervising engineer with the Eastern division of the Perolin Co. of America, 342 Madison Ave., New York City.

Prof. HARRY N. HOLMES of Oberlin College, Oberlin, Ohio, gave an interesting exhibit and talk recently on "Silica Gel" at the annual meeting of the Cleveland, Ohio, section of the American Chemical Society.

Dr. W. LEE LEWIS, director of the department of scientific research of the Institute of American Meat Packers, recently lectured before the local sections of the American Chemical Society at Rochester, Akron, Columbus, St. Louis and Kansas City, on the subject of "The Professor in the Packing Industry." Dr. Lewis is on a leave of absence from Northwestern University for the purpose of organizing the department of scientific research of the above association.

J. H. MCNASH has been elected president of the Hazel-Atlas Glass Co., Wheeling, W. Va., to succeed J. C. Brady, who will become chairman of the board of directors. Mr. McNash heretofore has acted as vice-president of the company.

D. W. MOFFIT, vice-president and director of manufacturing for Cosden & Co., Chicago, Ill., oil refiners, has returned to his desk following an illness of about 2 weeks duration.

CHARLES PIEZ, chairman of the board of directors of the Link Belt Co., Chicago, Ill., has been nominated for president of the Illinois Manufacturers Association and will be elected for the ensuing year at its December meeting.

GUY C. ROBINSON, heretofore research chemist for the United Bakeries Corporation, Chicago, Ill., has been appointed director of the department of research and analysis of that organization.

CHARLES M. SCHWAB, chairman of the board of directors, Bethlehem Steel Corporation, Bethlehem, Pa., was the principal speaker at the twelfth annual observance of the birthday of the late Andrew Carnegie by the Carnegie Institute of Technology, Pittsburgh, Pa., Nov. 21.

W. A. TAYLOR, formerly connected with the Chemical Warfare Service, is now chemical director for the LaMotte Chemical Products Co., Baltimore, Md.

C. FORREST TEFFT, manager of the Darlington Clay Products Co., Darlington, Pa., and factory manager of all plants of Fiske & Co., Inc., Watsontown, Pa., manufacturer of tapestry brick, has resigned to enter business for himself as a consulting ceramic engineer. He has been connected with the Fiske organization for about 10 years.

DR. MAXIMILIAN TOCH, of Toch Brothers, Inc., was the principal speaker at the November meeting of the Paint, Oil and Varnish Club, New York, at the Hotel Biltmore. He gave an interesting address on "The Scientific Awakening of China."

R. S. TOUR, head of the department of chemical engineering, University of Cincinnati, gave a very interesting lecture on "The Muscle Shoals Problem" before the joint meeting of the American Association of Engineers and the Engineering Society of Buffalo, at the Hotel Statler, Buffalo, N. Y., on Dec. 2.

Saklatwalla Gets Grasselli Medal

The Grasselli medal, which is awarded annually for the best paper read before the American Section of the Society of Chemical Industry, was presented to Dr. B. D. Saklatwalla last Friday night, Dec. 5, at the Chemists Club, New York. Dr. Saklatwalla, who is connected with the Vanadium Corporation of America, is noted for his researches on vanadium.

Dr. B. D. Saklatwalla

Obituary

ERNEST JEROME WINTER, chemical consulting engineer, of New York City, died in Stamford, Conn., on Sunday, Nov. 23, after a short illness from poisoning caused by an ulcerated tooth. He was 45 years old and was considered one of the most prominent authorities on the subject of distillation. For the past 2 years he had been actively engaged in the consulting work of remodeling distilleries into commercial alcohol plants and equipping them with carbon dioxide equipment.

Mr. Winter was educated and received a doctor's degree at the University of Budapest, Hungary. After completing his education, he traveled and worked in France, Belgium and Germany before coming to the United States.

In the United States he worked for several steel companies and one or two others before becoming associated with the American Cyanamid Co. in Nashville, Tenn., in 1907. With this company he was an important factor in the development of its process and the erection of the original plant at Niagara Falls, Ont. In 1909 he obtained leave of absence in order to design a retaining wall for the Ontario Power Co.'s power house to take the place of one which had been crushed by the ice jam in the Niagara River below the Falls. This work was so satisfactory that the power company employed Mr. Winter to design its surge tanks, one of which is now a monument of his engineering ability. He returned to the employ of the American Cyanamid Co. as chief engineer in 1912, at which time he designed considerable equipment now used by several companies in the manufacture of ammonia. Mr. Winter was responsible for the complete design of the Ammo Phos Corporation's plant at Warners, N. J., in 1916. Upon the completion of this plant, prior to leaving the employ of the American Cyanamid Co., he was working upon the preliminary layout for a plant at Muscle Shoals which later became the nucleus of the now famous Air Nitrate Plant.

On leaving this company in 1917, he became associated with Dr. Whitaker,

of the U. S. Industrial Alcohol, where he developed many new processes for that company's Curtis Bay, Md., and other plants. About 1919 he was general manager of the U. S. Food Products Co. at Peoria, Ill., and remained with this company until it was declared insolvent during the famous corner of the molasses market.

In 1921 Mr. Winter returned to New York City and was actively associated with Bond & Co. in developing new chemical processes. At this time he made an extensive trip through Europe to study chemical methods abroad. In 1922 he opened his own consulting office in New York City, where he was engaged at the time of his death. Mr. Winter was of a very retiring nature and for this reason much of his work is not properly credited and recorded. In spite of this reticence he was well known throughout the chemical field and his name appears many times in the U. S. Patent Office in connection with the development of new chemical processes and chemical equipment.

MATTHEW W. POTTS.

ISAAC W. AMBLER, general manager and treasurer of the Jeannette Co., Jeannette, Pa., died on Nov. 22, following an illness of a number of months. He was 38 years of age. Mr. Ambler is survived by his wife, his parents and two sisters.

HENRY B. BRAUER, chemical engineer with the New Jersey Zinc Co., Allentown, Pa., was killed in an automobile accident near LeSalle, Ill., on Nov. 22. He suffered a fractured skull. Mr. Brauer was only 28 years of age.

LEWIS EMERY, pioneer chemical manufacturer and oil producer, died in Philadelphia on Nov. 19 following an illness of several weeks duration. For many years Colonel Emery had been a prominent figure not only in the chemical and petroleum industries but in the political activities of Pennsylvania. For 11 years as state Senator from the Bradford district he waged a spectacular fight in the interest of the small, independent oil producers of that vicinity. Although defeated as a candidate for Governor in 1906, he was closely identified with the Republican organization until joining with his personal friend Theodore Roosevelt in the campaign of 1912. The chemical industry knew "Lew" Emery best through the American Acid & Alkali Co., of Bradford, Pa. As a pioneer manufacturer of oxalic acid by the potash-sawdust method, the company fought against severe German competition all through its industrial career. Colonel Emery took the fight to Congress and his testimony before the Ways and Means Committee in the interest of a high protective tariff on oxalic acid is one of the most interesting stories ever told of the struggles of the early chemical industry in this country. For a number of years the company also manufactured lactic acid, but both products were finally abandoned as the result of competition from abroad and from domestic sources. Colonel Emery was born on Aug. 10, 1839, in Cherry Creek, N. Y. His early education was in the district school and later at the college in Hinsdale, Mich. He returned to the Pennsylvania oil district in 1865 and took a prominent part in the industry of that vicinity for nearly 60 years.

JOHN LYELL HARPER, vice-president and chief engineer of the Niagara Falls Power Co. died on Nov. 28 in the Memorial Hospital, Niagara Falls, where he had undergone an operation for appendicitis. Mr. Harper was born in Harpersfield, N. Y., on Sept. 21, 1873, and was graduated from Cornell University in 1898 with the degree of mechanical engineer. After a few years experience in various parts of the country he went with the Niagara Falls Hydraulic Power & Manufacturing Co. in 1902 as assistant to the engineer. Later as chief engineer he was in charge of design and construction of Hydraulic Station 3A in the gorge below the Falls. With the formation of the Niagara Falls Power Co. in 1918 he was made chief engineer and later vice-president as well. His accomplishments during this association brought him recognition as one of the greatest of the world's hydro-electric engineering geniuses. In addition to these responsibilities, Mr. Harper found time to study the applications of electricity in the electrochemical and electrometallurgical industries at Niagara Falls and developed and patented several electric furnaces.

MONROE PATTERSON, of East Liverpool, Ohio, head of the Wellsville China Co., Wellsville, Ohio, and other industries in that section, died on Nov. 22, at the age of 72 years. He was prominent in the business and social life of the city, and was president of the Dollar Savings Bank, East Liverpool.

CHARLES F. STODDER, of Boston, Mass., president of the Woodley Soap Manufacturing Co. and president and general manager of the India Alkali Works, died on Nov. 23 at his residence, following an illness of several months duration. He was 65 years of age. He became head of the India Alkali organization in 1892.

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Smithsonian Institution, Washington, D. C., Dec. 29 to Jan. 3.

AMERICAN CERAMIC SOCIETY, annual meeting, Columbus, Ohio. Feb. 16 to 21, 1925.

AMERICAN CHEMICAL SOCIETY, New York Section, Dec. 12.

AMERICAN ELECTROCHEMICAL SOCIETY, Niagara Falls, April 23 to 25, 1925.

AMERICAN MANAGEMENT ASSOCIATION, New York, Dec. 11 and 12.

AMERICAN PETROLEUM INSTITUTE, annual meeting, Fort Worth, Tex., Dec. 9, 10 and 11.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, Niagara Falls, N. Y., June 4 to 6, 1925.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-eighth annual meeting, Atlantic City, N. J., June 22 to 26, 1925.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, twenty-third annual convention, Prince George Hotel, Toronto, Canada, Jan. 20 to 22, 1925.

CANADIAN PULP AND PAPER ASSOCIATION, Montreal, Jan. 28 to 30, 1925.

INSECTICIDE AND DISINFECTANT ASSOCIATION, eleventh annual meeting, New York, Dec. 15 and 16.

NEW JERSEY CLAY WORKERS, New Brunswick, N. J., Dec. 19.

SOUTHERN EXPOSITION, Grand Central Palace, New York, Jan. 19 to 31, 1925.

Trade Notes

The Salesmen's Association of the American Chemical Industry will hold a social gathering and Christmas dinner on Monday evening, Dec. 22. Harrison F. Wilmot is chairman of the entertainment committee.

Reports from the West state that the Ford Motor Co. has purchased the lease on the Red Bird lead mines near Mackay, Idaho.

Louis Rosenstein, head of the Portsmouth Cotton Oil Refining Corporation, has been elected president of Aspegren & Co. to succeed the late John Aspegren.

John E. Falkingham, manager of the New York office of Ellis Jackson & Co., has gone to Europe on a business trip.

C. G. Bull, who for several years acted as director of purchases for the Sherwin-Williams Co., has been made general manager of manufacturing. Frank E. Davis succeeds Mr. Bull as director of purchases.

A report from Ottawa, Canada, states that while in Edmonton, Alta., recently, E. M. Davis, of New York, representing a New York syndicate of financial men, announced that within the next 3 months work would be started on a plant to develop one of the Alberta lakes as a sodium sulphate producer. He stated that about $300,000 would be utilized in the enterprise. He also stated that the lake upon which his engineer had been at work was on the border line between Alberta and Saskatchewan.

Financial

At a special meeting of stockholders the recapitalization plan of the American International Corporation was approved. The plan provides for reconversion of the 490,000 shares of $100 par common stock into equal number of no par shares. The company also has and plans to exercise an option to purchase the 9,000 shares of preferred stock within 3 years at $70 a share.

The American Can Co. has announced it would call for redemption Feb. 1 at 102½ outstanding debentures due 1928. Holders have the privilege of presenting their debentures for redemption before Feb. 1 if they desire, receiving the call price of 102½ and accrued interest to date of presentation.

The report of the Daniel Boone Woolen Mills, Inc., for the quarter ended Sept. 30 shows net loss of $103,757 after depreciation, interest, discount, etc. For the first 9 months of 1924 the net profit totaled $49,490.

The Société Alsacienne de Produits Chimiques of France has increased its capital from 30,000,000 francs to 50,000,000 francs.

The Tide Water Oil Co. has declared its regular quarterly dividend of 1 per cent, payable Dec. 31.

Market Conditions

Moderate Buying in Spot Market for Chemical Products

Consuming Trades Fairly Well Covered for Current Month—Interest in Contracts Still in Evidence

AS THE year is drawing to a close consumers of chemicals and allied products are limiting buying to absolute needs and trading in the spot market is along moderate lines. Producers are carrying many orders for 1925 delivery and contracting in important chemicals has been fairly heavy in recent weeks. There still are reports of contract buying and with the consuming industries in an improved position, the outlook is generally regarded with favor.

The weighted index number for last week was 156.31, which compares with 155.70 for the preceding period. Strength in different chemicals together with a recovery in cottonseed oil was responsible for the higher average. A few chemicals were in an easier position last week but the majority of selections are firm and recent buying has demonstrated the confidence which buyers have in current values. The failure of calcium arsenate to sell in the quantities expected last season has had a decided bearing on the market for arsenic. At this time last year, large amounts of arsenic had been sold for forward deliveries. This year contract buying has been very limited and present reports do not indicate any tendency on the part of buyers to change their attitude. Reports of large carryover stocks of arsenic and arsenate have had a deterring effect on buying but the heavy financial losses incurred last season undoubtedly is the biggest factor in slowing up the market. It is pointed out, however, that present values are low and if demand for arsenate should set in, a possible shortage of arsenic would result.

High prices for metals has been a feature for some time. This has brought about a steady appreciation in values for metal salts, and tin salts were marked up for December delivery. Copper derivitives also are firm and the same is true of lead and zinc products.

Official figures, just made public, show that exports of chemical products in October were higher than for any preceding month of the year and were 14 per cent above those for October last year. Imports in October also were in excess of the September totals. Hence both branches of our foreign trade are progressing.

Acids

Census figures, issued last week, report a gain in domestic production of acids for 1923 as compared with the census returns for 1921. Not only was there an increase in total tonnage but also a gain in the output of each acid. Present demand for acids is generally described as satisfactory. Lactic acid has shown strength because of the good demand and the reduction in stocks. Critic and tartaric acids, while rather quiet, are not under the selling pressure recently noted and with good business looked for and foreign markets holding up, the indications point to higher prices for forward positions. Oxalic acid is less firm than other selections and sellers of imported have cut prices in order to attract buyers. Acetic acid has sold more freely and is quoted as steady. Sulphuric acid is moving against contracts and bookings for delivery over the first part of next year have accounted for a good part of production. Nitric acid is steadied by the unchanged position of raw materials and by the better buying which has featured the market.

Higher Prices for Tin Crystals and Bichloride of Tin — Bichromates Weak — Fusel Oil Firmer — Export Buying in Caustic Soda — Oxalic Acid Easier — Arsenic Dull — Denatured Alcohol Holds Strong Position — Carbonate of Potash Firm—Good Call for Soda Ash—Lactic Acid Firmly Held —Prussiates Steady — Nitrite of Soda Offered on Contract

Potashes

Bichromate of Potash—Buying was reported to be quiet and large lots were not commanding attention. There are reports that sellers have offered this material as low as 8¼c. per lb. but the open quotation is 8½@8¾c. per lb. Export inquiry has been slow and in October only 56,187 lb. was shipped abroad as compared with 307,690 lb. in October, 1923.

Carbonate of Potash—Stocks of all grades of imported carbonate have been reduced and values are more firmly held. Calcined 80-85 per cent is nominal on spot with shipments quoted at 6@6¼c. per lb. Reports from foreign centers indicated strong prices for all grades. Imports of carbonate in October amounted to 217,260 lb. as against 449,026 lb. in October, last year.

Caustic Potash — That consumption has been along broader lines this year is shown by import statistics. In the 10-month period ended October, imports were 9,906,940 lb. as compared with 8,075,553 lb. in the corresponding period a year ago. There has been some irregularity in the prices quoted for spot caustic, with 7½c. per lb. as the open price, but this can be shaded. Shipments from abroad are offered at 7¼c. per lb. Demand has been rather light and consumers are said to be supplied for the present.

Permanganate of Potash—The market has held a quiet position. Offerings are not heavy and importers say that markets abroad are firm. Spot permanganate is quoted at 14@15c. per lb. according to quantity and seller. Shipments are nominal around 15c. per lb.

Prussiate of Potash—Red prussiate is reported to be available at 36½c. per lb. but demand is light. Yellow prussiate is not selling in a large way but holders are not inclined to cut prices and spot material is quoted at 16½c. per lb. and upward. For shipment from abroad it is said that 16c. per lb. can be done but in some quarters shipments are held on the same basis as spot material.

Sodas

Bichromate of Soda—This material has been attracting considerable attention. Some sellers have been eager for business and the low prices which have been quoted have not brought the price level down to a point where values were steady. In addition to contract business, competition has extended to relatively small lots for prompt and nearby delivery. While most sellers have tried to hold 6½c. per lb. as an inside price, buyers have been able to do better and as low as 6¼c. per lb. has been quoted. Some factors say they cannot meet this price and production is becoming more centralized. Chrome ore is quoted at $18.50 per ton for Indian, $21.50 per ton for Rhodesian, and $24 per ton for New Caledonian, the prices being c.i.f. Atlantic ports.

Caustic Soda—There were reports of better inquiry for export and some good sized lots were sold for shipment abroad. Quotations for export ranged from $2.87½ per 100 lb. to $3.05 per 100 lb. f.a.s. Official figures give exports in October at 8,742,418 lb., which compares with 7,498,635 lb. in October last year. Exports for the 10-month period, however, are considerably below those for the corresponding period last year. Fair jobbing demand continues to come from the domestic trade and contract placements have been heavy. Prices are quoted as firm with the con-

tract price at $3.10 per 100 lb. for solid 76 per cent in carlots at works.

Nitrite of Soda—Arrivals of nitrite from abroad in October showed a gain over the months immediately preceding. The total was 233,403 lb. as against 78,537 lb. in October last year. Stocks of nitrite on spot are not large and offerings are firmly held at 9½c. per lb. It is stated that domestic makers are offering freely for shipment from works on a basis of 9c. per lb. Contracts for 1925 delivery are reported to be available at 8¼@8¾c. per lb. The advantage in price at present seems to be in favor of the home-made product.

Prussiate of Soda — Consumption is said to have gained in volume in the past month and orders also have been placed for future delivery. The spot market is not active but small lots are moving with sellers quoting 9½c. per lb. Shipments from foreign centers are offered at 9c. per lb. Imports in October were 379,302 lb. as compared with 78,778 lb. in October last year.

Miscellaneous Chemicals

Acetate of Lime—Production of this chemical in October is reported at 9,803,414 lb., shipments at 11,883,281 lb., and stocks at the end of October at 14,996,985 lb. With the exception of April, shipments were larger than in any other month of this year. Stocks on hand also were at the lowest point of the year. There has been no change in market quotations and sellers continue to ask $3 per 100 lb. for round lots. Export trade has improved and in October outward shipments were 1,367,416 lb. as compared with 336,000 lb. in October, last year.

Arsenic—Sellers of domestic are offering at 6½@6¾c. per lb. delivered but the market is inactive. Imported grades also were dull last week. Japanese grades are held around 6c. per lb. for shipment with spot holdings nominally quoted at 6½c. per lb. Imports in October were 1,304,872 lb. as compared with 1,393,368 lb. in October, last year.

Bleaching Powder — The decline in export buying this year is again illustrated by official returns, which show exports in October were 1,942,370 lb. as compared with 2,616,974 lb. in October last year. For the 10 months ended October, exports were 18,373,393 lb. in 1924 and 25,957,405 lb. in 1923. Contract business in bleaching powder placed in the past few weeks is said to have been heavy. Values appear to be firmly established with the contract figure at $1.90 per 100 lb. for large drums, carlots, f.o.b. works.

Fusel Oil—There has been a better demand for the crude product and stocks are reported as small. The lowest asking price is $3.25 per gal. with $3.50 per gal. asked by some holders. Refined oil is nominally quoted at $4.25 per gal.

Sal Ammoniac — Steady call is reported for domestic grades with values on an unchanged basis. The white is quoted at 7@7½c. per lb. at works and the gray at 8@8½c. per lb. Imported white is receiving moderate attention with spot holdings at 6@6½c. per lb. and forward positions at 5¾@5½c.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	156.31
Last week	155.70
Dec., 1923	165.00
Dec., 1922	164.00
Dec., 1921	145.00
Dec., 1920	189.00
Dec., 1919	245.00
Dec., 1918	277.00

The advance of 61 points in the weighted index number reflects higher prices for tin salts and cottonseed oil. Lower prices prevailed for bichromates and linseed oil.

Tin Crystals—The average price for Straits tin for November was 54.348c. per lb. The higher price level for the metal resulted in revised quotations for tin crystals for December delivery. The new prices are on a basis of 38½c. per lb. Bichloride of tin also was advanced and is now held at 15½c. per lb. Tin oxide was unchanged at 58c. per lb.

Alcohol

Active trading in denatured alcohol was reported by most sellers and a firm undertone prevailed in all quarters. Stocks are scanty and second hands have been disposing of spot goods at a premium. First hands, however, continued to quote the market as unchanged on all grades. Special denatured, 190 proof, formula No. 1, held at 55@55½c. per gal., in drums, carload basis.

Offerings of methanol were ample and the market was barely steady. Nominally the market stood at 72c. per gal., in drums, on the 97 per cent grade, carload lots. Production in October was placed at 539,333 gal., which compares with 464,702 gal. in September.

Coal-Tar Products

Byproduct Coke Oven Operations Increase—Steady Market for Crudes—Naphthalene Imports Drop Off Sharply

FURTHER progress was made in production of crudes. In the past week the output of byproduct coke was augmented in several directions so as to meet the growing demands of the iron and steel industries. This led to freer offerings of crudes for future delivery, but resulted in little if any change in the spot situation. Prices held comparatively steady. Official statistics revealed a rather sharp decline in imports of crude naphthalene for the month of October, the movement being the smallest since April, 1922. Demand for naphthalene has been slow for some time past and with domestic operators in a position to offer supplies on a more favorable trading basis the incentive to import has disappeared. Imports of creosote oil continue large, running ahead of last year. There was no important change in the division for intermediates. Prices remain unstable, reflecting keen competition for business pending. The call for intermediates has been less active. Imported pyridine was barely steady on moderate business. Phenol is working into a firmer position, but producers announced no change in the selling basis.

Aniline Oil and Salt—With holdings light and the demand making steady gains the market for aniline oil was firmer, first hands reporting transactions on the carload basis of 16c. per lb., drums extra, prompt shipment from works. Aniline oil for red was nominally unchanged at 40c. per lb. Aniline salt was inactive, but offerings were moderate and the market appeared firmer at 21@22c. per lb.

Benzene — News from producing centers was more favorable and this led to the belief that supplies of benzene will soon be larger. The offerings of spot and nearby material, however, remain light and prices generally steady. Producers quote 23c. per gal. on the 90 per cent grade and 25c. per gal. on the pure, tank cars, f.o.b. works. Exports of benzene in October amounted to 17,165 lb., which compares with 9,046,866 lb. in October, 1923.

Creosote — Foreign markets were steady on good inquiry from America. Imports of creosote oil during October amounted to 5,056,808 gal., which compares with 9,930,939 gal. in October a year ago. Imports for the 10 months ended Oct. 31 amounted to 72,334,821 gal., which compares with 55,796,077 gal. for the corresponding period a year ago.

H Acid—Fair buying interest in evidence, but offerings reported here and there at concessions. Prices heard range from 70@74c. per lb., depending upon the make and quantity.

Naphthalene—There was no change in the situation, prices holding about steady in anticipation of better trading conditions in the near future. Producers were not inclined to force selling and a feature in the market was the firm position of futures. First hands named 5½c. per lb. as inside on white flake for 1925 delivery. Spot material might have been secured at concessions in some quarters of the market. Crude naphthalene to import was nominal at 2c. per lb. Imports of naphthalene in October amounted to 220 lb., which compares with 734,598 lb. in October a year ago. Imports for the 10 months ended Oct. 31 amounted to 4,915,467 lb., which compares with 17,796,899 lb. for the same time in 1923.

Paranitraniline — The market was easier, offerings appearing at 65c. per lb., immediate shipment. Some sellers held out for 67c. per lb. Demand reported as fair.

Phenol—Bulk of production being absorbed by makers of phenolic resins and the market, while quotably unchanged, was regarded as slightly firmer. Producers quote 24@25c. per lb., the inside figure obtaining on round lots, prompt and forward delivery.

Vegetable Oils and Fats

Crude Cottonseed Oil Advances—Linseed Declines—China Wood Up —Soap Makers Buy Palm Kernel Oil—Tallow Scarce

ROUND lots of crude cottonseed oil were absorbed by refiners at slightly higher prices. Refined cottonseed oil was strong early in the week, but unsettled toward the close on liquidation which originated in the Middle West. Demand for linseed oil was slow and competition among crushers for new business brought out a lower trading basis. Coconut oil was offered more freely for future delivery. Soap makers bought a round lot of English palm kernel oil. Palm oils for nearby delivery were strong on limited holdings. Refined rapeseed oil was available at concessions. Cables from China reported a higher market for wood oil. Tallow was firm.

Cottonseed Oil—Good trading took place in crude cottonseed oil, refiners taking most of the offerings at prices ranging from 9@9½c. per lb., tank cars, f.o.b. mills, the outside figure obtaining in the Southeast. Compared with a week ago the market for crude advanced ⅛@¼c. per lb. Cash trade in refined oil was good, while compound makers also were able to move liberal quantities. Exports of refined cottonseed oil to Europe again were fairly large. There was a more active option market for refined cottonseed oil on the Produce Exchange, speculators operating more extensively in May oil, buying this position against sales of lard. Later Western speculators sold some of their January holdings, causing unsettlement in prices in the nearby positions. Refined prime summer yellow oil ex store was held at 11½c. per lb., in bbl. In the option market January settled at 10.97@10.99c. and May at 11.36@11.37c. Cash lard in Chicago settled on Thursday at 15.20c. per lb., with May lard at 15.62c. per lb. Export demand for lard showed improvement. Stocks of pure lard in Chicago on Dec. 1 amounted to 8,927,870 lb., which compares with 7,017,243 lb. on the corresponding date a year ago. In view of the large receipts of hogs the gain in stocks of lard has been disappointing.

Linseed Oil—Flaxseed at Duluth was unchanged to ⅜c. per bu. higher for the week, yet oil prices were lower. Demand for linseed oil was quiet and several crushers appeared more aggressive on the selling end, bringing out a lower range of prices for spot as well as forward deliveries. Raw oil for December-February delivery was available at $1.05 per gal., in bbl., carload lots, with March forward nominal at $1.06 per gal. Resale oil sold for December delivery at $1.04 per gal., cooperage basis. Crushers look for a quiet buying period until after the holidays and regard the decline as just a natural reaction from the recent sharp advance in prices. Duluth reported large shipments of seed to points east, reducing stocks considerably. December seed at Duluth settled on Thursday at $2.64⅞, with May at $2.72 per bu. Buenos Aires quoted the December option at $2.16½, a decline of 2c. for the week. Demand for Argentine seed has suffered somewhat ever since the official estimate on production came out and this has unsettled prices. Trade authorities still regard the Argentine situation as firm and believe that the official estimate on the crop will prove too high. Advices from Buenos Aires, under date of Nov. 10, state that dealers estimate exportable surplus at 28,000,000 to 42,000,000 bu. on present conditions. Prospects point to a fairly good yield in the province of Buenos Aires and south Santa Fe, but conditions in the North, Cordoba and Entre Rios are anything but favorable.

China Wood Oil — The market strengthened on bullish news from China, the market in the Orient being strong and higher. In New York spot oil was advanced to 15¾@16c. per lb., in bbl. On the Pacific coast 14c. was quoted on tank car shipments, with the price mostly nominal.

Menhaden Oil Production Below Normal

The 1924 menhaden fishing season, which came to a close last week, was a poor one, the output of the factories located on the Atlantic seaboard being 60 per cent smaller than a year ago. Production is estimated at 60,000 bbl., which compares with 150,000 bbl. in 1923 and 123,000 bbl. in 1922. Most of the oil produced was made in the Southern fish factories. The poor season caused several plants to shut down because of financial difficulties.

Production of crude menhaden oil for the past 10 years follows:

	Bbl.		Bbl.
1924	*60,000	1919	108,500
1923	150,000	1918	79,000
1922	123,000	1917	73,500
1921	129,000	1916	78,000
1920	117,000	1915	55,000

*Estimated yield.

Corn Oil—Crude oil sold at 10½c. per lb., tank cars, December shipment from Chicago. Offerings were light.

Coconut Oil—Reports on the market were conflicting, but in most quarters there was an easier feeling on futures. Manila oil was offered for January forward shipment at 10c. per lb., tank cars, f.o.b. New York. On the Pacific coast several cars of Ceylon type oil sold for late December shipment at 9⅝c. per lb., tanks. San Francisco reported offerings of January forward at 9¾c. per lb., tank car basis. Copra closed at 6c. bid and 6¼c. asked, c.i.f. New York.

Palm Kernel Oil—A bulk lot of English oil sold to a soap maker for forward delivery at 9½c. per lb., c.i.f. New York.

Palm Oils—Lagos palm oil was scarce and the price nominal at 9¾c. per lb., in casks, nearby delivery. Niger held at 8½c. per lb. Traders shy in making offerings of nearby material on intimation that a short interest exists in this commodity.

Rapeseed Oil — English refined oil offered at 97@99c. per gal., forward shipment. One lot of spot oil sold at 97c. per gal.

Soya Bean Oil—Crude soya offered for shipment from the Orient at 8.30c. per lb., bulk basis, in bond, c.i.f. San Francisco. Prompt oil scarce and market nominal at 12c. per lb., tank cars, duty paid, coast.

Fish Oils—Menhaden season closed. Offerings of crude oil small and prices firm. One lot of North Carolina oil sold at 53½c. per gal., loose, f.o.b. factory. Newfoundland tanked cod oil on spot steady at 63@65c. per gal. Domestic sardine oil 52c. asked, tank cars, f.o.b. Pacific coast points.

Tallow, Etc.—Market for extra special tallow firm on reports that soap makers have paid 10¼c. per lb. Officially the market held at 10c., f.o.b. melter's plant. Yellow grease firm at 8¾@9c., as to acidity. No. 1 oleo oil sold at 15¾c. per lb., in bbl. Oleo stearine higher at 12c. per lb.

Miscellaneous Materials

Antimony — Offerings reported at 14½c. per lb. on Chinese material, a decline of ¼c. for the week. Cookson's "C" grade advanced to 17¾c. per lb. Chinese needle, lump, 10c. per lb., nominal. Standard powdered needle, 200 mesh, 11½c. per lb. White oxide, Chinese, 99 per cent, 13@14c. per lb.

Barytes—Demand has been sufficient to absorb offerings and the market retains a steady undertone. Crude held at $8.50 per ton, Missouri mines. Crude, f.o.b. Georgia mines, also held at $8.50 per ton. Ground or color, $13 per ton, and white, $17 per ton, f.o.b. Baltimore. Water ground and floated, bleached, $23 per ton, f.o.b. St. Louis.

Glycerine — Dynamite unchanged at 17¼@17½c. per lb., in drums, f.o.b. Middle West. Market quiet, but steady. Chemically pure in New York in good request and steady at 18¾@19c. per lb., drums included. Soap-lye crude, basis 80 per cent, offered at 11¾@12c. per lb., loose, f.o.b. point of production. Arrivals of foreign crude reported at New York in larger volume.

Lithopone — Some good contracting has taken place and market appears steady. Leading makers repeated prices on the basis of 6c. per lb., carload lots.

White Lead—There was little or no change in the general situation. The market for the metal was inactive, but quotably unchanged at 8.65c. per lb. In lead pigments trading has slowed up, but this is not unusual for this time of the year as it applies only to new business. Corroders have a normal volume of business in their books and regard the outlook as promising. The market for standard dry white lead held at 10¼c. per lb., carload basis.

Zinc Oxide — Rubber makers have been less active on the buying end, but steady prices obtained in nearly all quarters, reflecting higher markets for the metal. American process lead free oxide held at 7⅞c. per lb.

Imports at the Port of New York

November 27 to December 4

ACIDS—Cresylic—1 dr., Glasgow, Order. **Diethylbarbituric** — 3 cs., Southampton, Kachurin Drug Co.; 14 cs., Southampton, Order. **Acetic**—2 pkg., London, Order. **Citric**—100 csk., Palermo, C. L. Huisking, Inc. **Oxalic**—20 csk., Antwerp, Kachurin Drug Co.; 25 csk., Christiania, Roessler & Hasslacher Chemical Co. **Formic** — 115 carboys, Rotterdam, R. W. Greeff & Co. **Stearic**—63 cs., Rotterdam, Ponds Extract Co.; 20 cs., Rotterdam, M. W. Parsons & Plymouth Organic Lab. **Tartaric** — 100 csk., Palermo, Order.

ALBUMEN — 28 cs., Liverpool, T. M. Duche & Sons; 25 bbl., Trieste, Equitable Trust Co.

AMMONIUM SULPHATE — 10 kegs, Liverpool, Mallinckrodt Chemical Works.

ANTIMONY REGULUS—250 cs., London, Order; 101 bg., Liverpool, Order; 250 cs., Hankow, C. Hardy, Inc.

ARSENIC — 40 dr. white, Hamburg, Chemical National Bank.

BARYTES—73 csk., Hamburg, A. Hurst & Co.; 500 bg., Rotterdam, L. H. Butcher & Co.; 110 csk., Rotterdam, Order.

CALCIUM CHLORIDE — 155 dr., Rotterdam, E. Suter & Co.

CALCIUM NITRATE—31 csk., Rotterdam, Kuttroff, Pickhardt & Co.

CASEIN—8 pkg., Copenhagen, A. Hurst & Co.

CHALK — 1,000 bg., Antwerp, Brown Bros. & Co.; 500 bg., Antwerp, Order; 200 bg., Antwerp, L. H. Butcher & Co.; 600 bg., Antwerp, Brown Bros. & Co.; 400 bg., Antwerp, Brown Bros. & Co.; 1,100,000 kilos crude, Dunkirk, Taintor Trading Co.

CHEMICALS—274 bg., Glasgow, Brown Bros. & Co.; 707 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 150 csk. and 190 dr., Hamburg, A. Klipstein & Co.; 140 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 100 bg. and 64 csk., Rotterdam, A. Klipstein & Co.; 24 csk., Rotterdam, Mallinckrodt Chemical Works; 231 csk., Rotterdam, Roessler & Hasslacher Chemical Co.; 32 cs., Hamburg, E. Dietzgen & Co.; 20 cs., Hamburg, Katchurin Drug Co.; 200 bbl., Hamburg, Cooper & Cooper.

CHROME ORE—400 tons, Beira, Order.

CORUNDUM ORE—185 bg., Beira, Order; 723 bg., Port Natal, Funch, Edye & Co.

COLORS—16 csk. ultramarine blue, Glasgow, A. Maharrie; 9 bbl. aniline, Genoa, Irving Bank-Col. Trust Co.; 5 pkg. do., Genoa, Order; 100 csk. venetian red, Liverpool, J. Lee Smith & Co.; 10 dr. aniline, Liverpool, Order; 5 csk. dry, Southampton, Sherwin-Williams Co.; 12 csk. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 9 csk. do., Hamburg, H. A. Metz & Co.; 5 pkg. do., Hamburg, Franklin Import & Export Co.; 2 csk. dry, Hamburg, American Aniline Products Co.; 9 csk., Genoa, Irving Bank-Col. Trust Co.; 13 pkg. aniline, Genoa, Bernard, Judae & Co.; 10 pkg. do., Genoa, American Exchange National Bank; 11 bbl. do., Genoa, L. & R. Organic Products Co.; 2 bbl. aniline, Antwerp, Fidelity International Trust Co.; 5 pkg. do., Antwerp, Irving Bank-Col. Trust Co.; 4 csk. do., Antwerp, American Exchange National Bank; 20 csk., Hamburg, E. M. & F. Waldo; 3 csk., Rotterdam, Bernard, Bernard, Inc.; 13 pkg. aniline, Rotterdam, Kuttroff, Pickhardt & Co.

CREOSOTE—6 dr. oil, Glasgow, Order.

DEXTRINE — 250 bg., Copenhagen, Equitable Trust Co.; 450 bg., Copenhagen, Stein, Hall & Co.; 100 bg., Rotterdam, Spier, Simmons & Co.

FORMALDEHYDE HYDROSULPHITE—60 dr., Antwerp, E. Ritter.

FELDSPAR — 202 bg. ground, Christiania, Order.

FERROCHROME — 55 csk., Gothenburg, C. Hardy, Inc.

FERROSILICON — 71 dr., Antofagasta, Chile Exploration Co.

FULLERS EARTH—250 bg., London, L. A. Salomon & Bros.

GAMBIER—2,550 cs., Singapore, Order; 144 cs., Singapore, L. Littlejohn & Co.

GLAUBER SALT — 250 bg., Antwerp, Order.

GLYCERINE—50 dr., Buenos Aires, Order; 10 dr., Marseilles, Order; 10 dr., Antwerp, Order; 20 dr., Havre, Order; 60 dr., Marseilles, Order.

GUMS—83 bg. tragacanth, London, Bank of Montreal; 63 bg. copal, London, S. Winterbourne & Co.; 27 bg. do., London, Chemical National Bank; 262 bg. arabic, Port Sudan, Orbis Products Co.; 54 pkg. manjak, Barbados, Order; 144 bg. copal, Antwerp, W. H. Scheel & Co.; 185 bg. copal, Antwerp, Chase National Bank; 310 bg. copal, Antwerp, Chemical National Bank; 122 bg. copal, Antwerp, Order; 720 bg. arabic, Bombay, Guaranty Trust Co.; 375 bg. do., Bombay, Brown Bros. & Co.

IRON OXIDE — 41 csk., Liverpool, Reichard-Coulston, Inc.; 4 csk., Antwerp, Order; 10 csk., Liverpool, Stanley Daggett Co.; 16 csk., Liverpool, Reichard-Coulston, Inc.; 32 bbl., Liverpool, L. H. Butcher & Co.; 39 csk., Liverpool, J. A. McNulty; 339 bbl., Malaga, Order.

KAOLIN—400 bg., Hamburg, Lunham & Moore.

LOGWOOD EXTRACT—241 csk., Port Antonio, American Dyewood Co.

LITHOPONE—1,400 csk., Antwerp, Benjamin Moore & Co.; 320 csk., Rotterdam, Brown & Roese.

MANGANESE ORE — 5,638 tons (to Balt.), from Batoum, Order.

MAGNESIUM CHLORIDE — 85 dr., Hamburg, Brown Bros. & Co.; 173 dr., Hamburg, Innis, Speiden & Co.; 87 dr., Hamburg, Order.

MAGNESITE — 170 bg., Rotterdam, A. Kramer & Co.

MYROBALANS — 10,093 bg., Bombay, Order.

OILS—Cod—125 csk., St. Johns, R. Badcock & Co.; 100 bbl., Liverpool, Chemical National Bank. **Coconut** — 824 tons (in bulk), Manila, Procter & Gamble Co. **China wood**—288 csk., Hankow, Irving Bank-Col. Trust Co.; 150 csk., Hankow, Seral Trading Co. **Olive foots** (sulphur oil)—200 bbl., Palermo, Order; 500 bbl., Palermo, Heidelbach, Ickelheimer & Co.; 100 bbl., Bari, Leghorn Trading Co.; 100 bbl., Palermo, Order; 100 csk., Leghorn, Leghorn Trading Co. **Palm** — 39 csk., Liverpool, Fourth Street National Bank; 156 csk., Liverpool, Order; 238 dr., Antwerp, Niger Co.; 209 csk., Liverpool, Order. **Peanut**—485 csk., Bordeaux, American Shipping Co. **Sperm**—30 bbl., Glasgow, Order.

OILSEEDS — Copra — 525 bg., Belize, Franklin Baker Co. **Castor** — 2,000 bg., Santos, Central Union Trust Co.; 2,000 bg., Santos, Seaboard National Bank; 3,704 bg., Cocanada, Volkart Bros.; 1,464 bg., Cocanada, Order; 4,840 bg., Bombay, Order; 394 bg., Bombay, Volkart Bros.

PAINT—100 dr., London, L. Sonneborn & Sons.

PLUMBAGO — 230 bbl., Colombo, National City Bank.

POTASSIUM SALTS—18 pkg. prussiate, Liverpool, C. Tennant Sons Co.; 364,014 kilos manure salt and 2,001 bg. muriate, Hamburg, Potash Importing Corp. of Am.; 2,600 bg. muriate, Antwerp, Societe Comm. des Potasses d'Alsace; 180 csk. nitrate, Rotterdam, Order; 68 cs. cyanide and 19 bbl. salts, Hamburg, Roessler & Hasslacher Chemical Co.; 350 bg. sulphate, Hamburg, Potash Importing Corp. of Am.

PYRIDINE—11 csk., Havre, Order.

QUICKSILVER — 100 flasks, London, Order; 600 flasks, Leghorn, Order; 50 flasks, Antwerp, A. Pickering.

QUEBRACHO—17,996 bg., Buenos Aires, Tannin Corp.

ROCHELLE SALT—20 csk., Hamburg, A. J. Marcus, Inc.

SAL AMMONIAC—40 csk., Rotterdam, Kuttroff, Pickhardt & Co.

SHELLAC — 100 bg., Calcutta, British Overseas Bank; 100 bg., Calcutta, Standard Bank of South Am.; 1,183 bg., Calcutta, Order; 591 cs. seedlac, Calcutta, Order; 100 cs., Hamburg, Order.

SIENNA—500 bg., Leghorn, Brown Bros. & Co.; 90 bbl., Leghorn, Order; 356 pkg., Leghorn, Reichard-Coulston, Inc.

SODIUM SALTS — 7,134 bg. nitrate, Iquique, Antony Gibbs & Co.; 13,670 bg. nitrate, Iquique, Anglo South Am. Trust Co.; 22 csk. prussiate, Liverpool, C. Tennant Sons & Co.; 136 bbl. silico fluoride, Copenhagen, Order; 500 bg. phosphate, Antwerp, Order; 35 csk. prussiate, Liverpool, Order; 811 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 89 csk. nitrite, Christiania, Norwegian Nitrogen Co.; 20 csk. do., Christiania, Eastman Kodak Co.; 8,083 bg. nitrate, Iquique, W. R. Grace & Co.; 7,092 bg. nitrate, Antofagasta, W. R. Grace & Co.; 195 cs. cyanide, Liverpool, Order.

STARCH — 650 bg. potato, Copenhagen, Equitable Trust Co.; 1,050 bg., Copenhagen, Stein, Hall & Co.; 250 bg., Rotterdam, Order.

SILVER SULPHIDE—121 cs., Antofagasta, Watson, Geach & Co.

SUMAC — 1,274 bg. ground, Palermo, Order.

TALC — 250 bg., Genoa, National City Bank; 1,400 bg., Genoa, Order; 1,000 bg., Genoa, Italian Discount & Trust Co.; 500 bg., Genoa, L. A. Salomon & Bro.

TARTAR—18 csk., Leghorn, Royal Baking Powder Co.; 564 bg., Alicante, Tartar Chemical Works.

VANADIUM ORE — 6,398 bg., Callao, Vanadium Corp. of Am.

WATTLE BARK—7,530 bg., Port Natal, Tannin Corp.; 548 bg., Port Natal, Standard Bank of S. A.; 115 bg., Port Natal, E. J. Haley.

WAXES—94 bbl. spermaceti, Glasgow, Order; 25 bg. beeswax, Havana, Order; 38 bl. beeswax, Lisbon, Order; 44 cs. beeswax, Havre, Hummel & Robinson; 25 cs. beeswax, Rotterdam, Order; 49 pkg. beeswax, Alexandria, Bank of America.

WHITING—1,000 bg., Havre, Hammill & Gillespie; 2,000 bg., Havre, S. L. Libby Corp.

ZINC OXIDE—50 bbl., Antwerp, Reichard-Coulston Inc.; 50 bbl., Antwerp, Philipp Bros.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

AMMONIA, sulphate of. Chatham, Canada. Purchase.—12,482.

CARBON GAS BLACK. Manchester, England. Purchase and agency.—12,471.

FOOD COLORS. Brussels, Belgium. Agency.—12,440.

FOOD COLORS. Matanzas, Cuba. Purchase.—12,470.

COPPER SULPHATE. Stuttgart, Germany. Purchase.—12,472.

ANILINE DYES. Helsingfors, Finland. Agency.—12,443.

GALALITH, pyroxylin plastice and phenolic condensation products. Mexico City, Mexico. Purchase.—12,476.

NAVAL STORES. Hamburg, Germany. Purchase.—12,479.

BICHROMATE OF SODA and bichromate of potash. Stuttgart, Germany, Purchase.—12,472.

Discovery of Missing Element May Be Near

At the Nov. 29 meeting of the American Physical Society at Ann Arbor, Mich., Prof. C. J. Lapp described recent spectographic studies on rare earth compounds prepared by his colleague, B. S. Hopkins. By means of X-ray spectographs, Professor Lapp claims to have discovered a faint line whose wave length corresponds to that predicted for the missing element 61, which in the periodic table should lie between neodymium and samarium.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

Industrial Chemicals

Acetone, drums, works	lb.	$0.15 –	$0.16
Acetic anhydride, 85%, dr	lb.	.34 –	.36
Acid, acetic, 28%, bbl	100 lb.	3.12 –	3.37
Acetic, 56%, bbl	100 lb.	5.85 –	6.10
Acetic, 80%, bbl	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl	100 lb.	11.01 –	11.51
Boric, bbl	lb.	.09 –	.09½
Citric, kegs	lb.	.45½–	.46½
Formic, 85%	lb.	.11 –	.11½
Gallic, tech	lb.	.45½–	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl	lb.	.12½–	.13
22% tech., light, bbl	lb.	.06 –	.06½
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl	lb.	.09½–	.09¾
Phosphoric, 50% carboys	lb.	.07½–	.07¾
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl	lb.	.65 –	.70
Tannic, tech., bbl	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.26½–	.27
Tartaric, domestic, bbl	lb.	.29 –	.30
Tungstic, per lb	lb.	1.20 –	1.25
Alcohol, butyl, drums, wks	lb.	.27 –	.30
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.89 –	.....
Denatured, 190 proof No. 1, special bbl	gal.	.61 –	.....
No. 1, 190 proof, special, dr.	gal.	.55 –	.....
No. 1, 188 proof, bbl	gal.	.65 –	.....
No. 1, 188 proof, dr	gal.	.58 –	.....
No. 5, 188 proof, bbl	gal.	.60 –	.....
No. 5, 188 proof, dr	gal.	.55 –	.....
Alum, ammonia, lump, bbl	lb.	.03½–	.04
Potash, lump, bbl	lb.	.02¾–	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.35 –	1.40
Iron free, bags	lb.	2.35 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½–	.12¾
Nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.95 –	4.10
Antimony oxide, white, bbl	lb.	.13 –	.14
Arsenic, white, powd., bbl	lb.	.06½–	.06¾
Red, powd., kegs	lb.	.14½–	.15½
Barium carbonate, bbl	ton	54.00 –	55.00
Chloride, bbl	ton	64.00 –	70.00
Dioxide, 88%, drums	lb.	.17½–	.18
Nitrate, casks	...	.07¾–	.08¼
Blanc fixe, dry, bbl	lb.	.03½–	.03¾
Bleaching powder, f.o.b. wks., drums, contract	100 lb.	1.90 –	.....
Spot, wks., drums	100 lb.	2.00 –	2.15
Borax, bbl	lb.	.05 –	.05¼
Bromine, cases	lb.	.44 –	.46
Calcium acetate, bags	100 lb.	3.00 –	3.05
Arsenate, dr	lb.	.08 –	.08½
Carbide, drums	lb.	.05 –	.05¼
Chloride, fused, dr. wks	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Phosphate, mono, bbl	lb.	.06¾–	.07½
Carbon bisulphide, drums	lb.	.06 –	.06½
Tetrachloride, drums	lb.	.06¾–	.07½
Chalk, precip.—domestic, light, bbl	lb.	.04¼–	.04½
Imported, light, bbl	lb.	.04½–	.05
Chlorine, liquid, tanks, wks	lb.	.04¼–	.....
Contract, tanks, wks	lb.	.04 –	.....
Cylinders, 100 lb., wks	lb.	.05½–	.07½
Cobalt, oxide, bbl	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks	ton	15.00 –	16.00
Copper carbonate, bbl	lb.	.17 –	.17½
Cyanide, drums	lb.	.49 –	.50
Oxide, kegs	lb.	.16 –	.16½
Sulphate, dom., bbl	100 lb.	4.65 –	4.75
Imp. bbl	100 lb.	4.50 –	.....
Cream of tartar, bbl	lb.	.20½–	.21
Epsom salt, dom., bbl	100 lb.	1.75 –	2.00
Imp., tech., bags	100 lb.	1.35 –	1.40
U.S.P., dom., bbl	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd	lb.	.15 –	.16
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Acetate, 99%, dr	gal.	1.08 –	1.10
Formaldehyde, 40%, bbl	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl	lb.	.25 –	.....
Fusel oil, ref., drums	gal.	4.50 –	.....
Crude, drums	gal.	3.25 –	3.50
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Imp., bags	100 lb.	.90	.95
Glycerine, c. p., drums extra.	lb.	.18¼–	.19
Crude 80%, loose	lb.	.11¾–	.12
Hexamethylene, drums	lb.	.66 –	.70

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

Dyes	**Paper and Pulp**
Paint and Varnish	**Petroleum**
Ceramic Materials	**Soap**
Fertilizers	**Explosives**
Rubber	**Food Products**
Sugar	**Metal Products**

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

Lead:			
White basic carbonate, dry, casks	lb.	$0.10½–	.....
White, basic sulphate, casks	lb.	.10 –	.....
White, in oil, kegs	lb.	.1240 –	.....
Red, dry, casks	lb.	.11¾–	.....
Red, in oil, kegs	lb.	1362 –	.....
Acetate, white crys., bbl	lb.	.15½–	.....
Brown, broken, casks	lb.	.14½–	.....
Arsenate, white crys., bbl	lb.	.16 –	$0.18
Lime-Hydrated, b.g., wks	ton	10.50 –	12.50
Bbl., wks	ton	18.00 –	19.00
Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.11¼–	.....
Lithopone, bags	lb.	.06 –	.06½
Magnesium carb., tech., bags	lb.	.07 –	.08
Methanol, 95%, drums	gal.	.70 –	.72
97%, drums	gal.	.72 –	.74
Pure, tanks	gal.	.74 –	.76
drums	gal.	.78 –	.80
bbl	gal.	.83 –	.85
Methyl-acetone, t'ks	gal.	.70 –	.....
Nickel salt, double, bbl	lb.	.10 –	.....
Single, bbl	lb.	.10½–	.....
Orange mineral, csk	lb.	.14¼–	.14¾
Phosgene	...	.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Yellow, cases	lb.	.37½–	.40
Potassium bichromate, casks.	lb.	.08¼–	.08½
Bromide, gran., bbl	lb.	.42 –	.48
Carbonate, 80–85%, calcined, casks	lb.	.06 –	.06¼
Chlorate, powd	lb.	.06¾–	.08¼
Cyanide, drums	lb.	.47 –	.52
First sorts, cask	lb.	.08¼–	.08½
Hydroxide (caustic potash) drums	lb.	.07½–	.....
Iodide, cases	lb.	3.65 –	3.75
Nitrate, bbl	lb.	.06 –	.07¾
Permanganate, drums	lb.	.14 –	.15
Prussiate, red, casks	lb.	.36½–	.38
Prussiate, yellow, casks	lb.	.16¼–	.16¾
Salammoniac, white, gran., casks, imported	lb.	.06 –	.06½
White, gran., bbl., domestic	lb.	.07½–	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl	100 lb.	1.20 –	1.40
Salt cake (bulk) works	ton	16.00 –	18.00
Soda ash, light 58% flat, bulk, contract	100 lb.	1.25 –	.....
bags, contract	100 lb.	1.38 –	.....
Dense, bulk, contract, basis 58%	100 lb.	1.35 –	.....
bags, contract	100 lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	.....
Caustic, ground and flake, contracts, dr	100 lb.	3.50 –	3.85
Caustic, solid, 76% f.a.s. N. Y	100 lb.	2.87½–	3.05
Sodium acetate, works, bbl	lb.	.05 –	.05¼
Bicarbonate, bulk	100 lb.	1.75 –	.....
Bichromate, casks	lb.	.06¼–	.06½
Bisulphate (niter cake)	ton	6.00 –	7.00
Bisulphite, powd., U.S.P., bbl	lb.	.04¼–	.04½
Bromide, bbl	lb.	.43 –	.47
Chlorate, kegs	lb.	.06½–	.06¾
Chloride	long ton	12.00 –	13.00
Cyanide, cases	lb.	.19 –	.22
Flouride, bbl	lb.	.08½–	.09
Hyposulphite, bbl	lb.	.02¼–	.02½
Nitrite, casks	lb.	.09¼–	.09½
Peroxide, powd., cases	lb.	.23 –	.27
Phosphate, dibasic, bbl	lb.	.03½–	.03¾
Prussiate, yel. bbl	lb.	.09¼–	.09½
Salicylate, drums	lb.	$0.38 –	$0.40
Silicate (40°, drums)	100 lb.	.75 –	1.16
Silicate (60°, drums)	100 lb.	1.75 –	2.00
Sulphide, fused, 60-62%, drums	lb.	.02¾–	.03½
Sulphite, crys., bbl	lb.	.03¼–	.03½
Strontium nitrate, powd., bbl	lb.	.09 –	.09½
Sulphur chloride, yel drums	lb.	.04½–	.05
Crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Flour, bag	100 lb.	2.25 –	2.35
Dioxide, liquid, cyl	lb.	.08 –	.08½
Tin bichloride, bbl	lb	.15½–	.....
Oxide, bbl	lb.	.58 –	.58½
Crystals, bbl	lb.	.38½–	.....
Zinc carbonate, bags	lb.	.12 –	.14
Chloride, gran., bags	lb.	.06 –	.07½
Cyanide, drums	lb.	.40 –	.41
Dust bbl	lb.	.08 –	.08½
Oxide, lead free, bags	lb.	.07¾–	.....
5% lead sulphate bags	lb.	.06¾–	.....
French, red seal, bags	lb.	.09¾–	.....
French, green seal, bags.	lb.	.10¾–	.....
French, white seal, bbl	lb.	.11¾–	.....
Sulphate, bbl	100 lb.	3.25 –	3.50

Coal-Tar Products

Alpha-naphthol, crude, bbl	lb.	$0.60 –	$0.62
Alpha-naphthol, ref., bbl	lb.	.75 –	.80
Alpha-naphthylamine, bbl	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl	lb.	.21 –	.22
Anthracene, 80%, drums	lb.	.70 –	.75
Anthraquinone, 25%, drums.	lb.	.65 –	.70
Benzaldehyde U.S.P., tech., drums	lb.	.69 –	.71
Benzene, pure, tanks, works.	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl	lb.	.78 –	.80
Benzyl chloride, ref. carboys.	lb.	.35 –	.....
Benzyl chloride, tech., drums.	lb.	.25 –	.....
Beta-naphthol, tech., bbl	lb.	.24 –	.25
Beta-naphthylamine, tech	lb.	.65 –	.70
Cresylic acid, 97%, drums	gal.	.62 –	.64
95-97%, drums, works	gal.	.57 –	.59
Dichlorbenzene, drums	lb.	.07 –	.08½
Dinitrobenzene, bbl	lb.	.15 –	.17½
Dinitrochlorbenzene, bbl	lb.	.20 –	.21
Dinitrophenol, bbl	lb.	.35 –	.40
Dinitrotoluen, bbl	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
H-acid, bbl	lb.	.70 –	.74
Meta-phenylenediamine, bbl.	lb.	.90 –	.95
Monochlorbenzene, drums	lb.	.08½–	.10
Naphthalene, flake, bbl	lb.	.05 –	.05½
Naphthionate of soda, bbl	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.62 –	.63
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl	lb.	1.10 –	1.20
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	.11
Ortho-toluidine, bbl	lb.	.17 –	.18
Para-aminophenol, base, kegs	lb.	1.15 –	1.20
Para-dichlorbenzene, bbl	lb.	.17 –	.20
Para-nitraniline, bbl	lb.	.65 –	.67
Para-nitrotoluene, bbl	lb.	.40 –	.42
Para-phenylendiamine, bbl	lb.	1.30 –	1.35
Para-toluidine, bbl	lb.	.75 –	.80
Phenol, U.S.P., dr	lb.	.24 –	.26
Picric acid, bbl	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	4.00 –	4.15
Resorcinol, tech., kegs	lb.	1.30 –	1.40
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl	lb.	.50 –	.55
Salicylic acid, tech., bbl	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl	lb.	.35 –	.....
Solvent naphtha, water-white, tanks	gal.	.24 –	.25
Crude, tanks	gal.	.21 –	.22
Sulphanilic acid, crude, bbl	lb.	.16 –	.18
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	.....
Toluene, drums, works	gal.	.31 –	.....
Xylidine, drums	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.38 –	.40
Xylene, com., tanks	gal.	.25 –	.27

Naval Stores

Rosin B-D, bbl	280 lb.	$7.35 –	$7.40
Rosin E-I, bbl	280 lb.	7.35 –	7.40
Rosin K-N, bbl	280 lb.	7.45 –	7.50
Rosin W.G.-W.W., bbl	280 lb.	8.50 –	9.00
Turpentine, spirits of, bbl	gal.	.81 –	.81½
Wood, steam dist., bbl	gal.	.77 –	.78
Wood, dest. dist., bbl	gal.	.70 –	.74
Pine tar pitch, bbl	200 lb.	5.50 –	.....
Tar, kiln burned, bbl	500 lb.	12.00 –	12.50
Rosin oil, first run, bbl	gal.	.45 –	.....
Pine tar oil, com'l	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.05½
Grease, yellow, loose	lb.	.08¾ –	.09
Lard oil, Extra No. 1, bbl.	gal.	.96 –	.98
Lard compound, bbl.	lb.	.13 –	.13½
Neatsfootoil, 20 deg. bbl.	gal.	1.35 –	1.37
Oleo Stearine	...	.12 –	.....
Oleo oil, No. 1, bbl.	lb.	.15¾ –	.16
Red oil, distilled, d.p. bbl.	lb.	.11 –	.11½
Tallow, extra, loose works	lb.	.10 –	.....
Tallow oil, acidless, bbl.	gal.	.92 –	.94

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.17 –	$0.17½
Castor oil, No. 1, bbl.	lb.	.17½ –	.17¾
Chinawood oil, bbl.	lb.	.15¾ –	.16
Coconut oil, Ceylon, bbl.	lb.	.11¼ –	.11½
Ceylon, tanks, N. Y.	lb.	.10⅝ –	.....
Corn oil, crude, bbl.	lb.	.11¼ –	.11⅜
Crude, tanks, (f.o.b. mill)	lb.	.10¼ –	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09¼ –	.09½
Summer yellow, bbl.	lb.	.11½ –	....
Linseed oil, raw, car lots, bbl.	gal.	1.05 –	....
Raw, tank cars (dom.)	gal.	.99 –	....
Boiled, cars, bbl. (dom.)	gal.	1.07 –	....
Olive oil, denatured, bbl.	gal.	1.18 –	1.22
Sulphur, (foots) bbl.	lb.	.09½ –	.09¾
Palm, Lagos, casks	lb.	.09¾ –	.09⅞
Niger, casks	lb.	.08¾ –	.08⅞
Palm kernel, bbl.	lb.	.10 –	.10½
Peanut oil, crude, tanks (mill)	lb.	.12 –	.....
Refined, bbl.	lb.	.16 –	.16½
Perilla, bbl.	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.97 –	.98
Sesame, bbl.	lb.	.14¼ –	.14½
Soya bean (Manchurian), bbl	lb.	.13½ –	.....
Tank, f.o.b. Pacific Coast	lb.	.12 –	....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.64 –	$0.66
Menhaden, light pressed, bbl.	gal.	.70 –	.72
White bleached, bbl.	gal.	.72 –	.74
Crude, tanks (f.o.b. factory)	gal.	.53½ –	.58
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.90 –	.95
Cochineal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½ –	.05
Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags 100	lb.	4.52 –	4.79
Gum, bags 100	lb.	4.82 –	5.09
Divi-divi, bags	ton	42.00 –	43.00
Fustic, sticks	ton	30.00 –	35.00
Chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.18 –	.18½
Logwood, sticks	ton	25.00 –	26.00
Chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	150.00 –	160.00
Domestic, bags	ton	50.00 –	55.00
Starch, corn, bags 100	lb.	3.87 –	4.14

Extracts

Archil, conc., bbl.	lb.	$0.16 –	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½ –	.02¼
Divi-divi, 25% tannin, bbl.	lb.	.05 –	.05
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.11 –	.11½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, liquid, 51°, bbl.	lb.	.12 –	.13
Logwood, crys., bbl.	lb.	.14 –	.15
Liq., 51°, bbl.	lb.	.07½ –	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04¼ –	.04¾
Sumac, dom., 51°, bbl.	lb.	.06¼ –	.06¾

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.09 –	$0.11
spot, cases	lb.	.12 –	.16
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Prussian, bbl.	lb.	.35 –	.37
Ultramarine, bbl.	lb.	.07 –	.35
Browns, Sienna, Ital., bbl.	lb.	.05 –	.12
Sienna, Domestic, bbl.	lb.	.03 –	.03½
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.10½ –	.11½
Paris, bulk	lb.	.24 –	.26
Reds, Carmine No. 40, tins	lb.	4.25 –	4.50
Iron oxide red, casks	lb.	.08 –	.12
Para toner, kegs	lb.	.95 –	1.00
Vermilion, English, bbl.	lb.	1.25 –	1.30
Yellow, Chrome, C.P. bbls.	lb.	.17 –	.17½
Ocher, French, casks	lb.	.02 –	.03

Waxes

Beeswax, crude, Afr. bg.	lb.	$0.33 –	$0.33½
Refined, light, bags	lb.	.36 –	.37
Candellila, bags	lb.	.28 –	.28½
Carnauba, No. 1, bags	lb.	.36 –	.37
No. 2, North Country, bags	lb.	.28 –	.29
No. 3, North Country, bags	lb.	.24 –	.25
Japan, cases	lb.	$0.15½ –	$0.16
Montan, crude, bags	lb.	.06 –	.06½
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06 –	.06½
Crude, scale 124-126 m.p. bags	lb.	.05¼ –	.....
Ref., 118-120 m.p. bags	lb.	.05¾ –	.06
Ref., 123-125 m.p., bags	lb.	.06 –	.06½
Stearic acid, sgle. pressed, bags	lb.	.11½ –	.12½
Double pressed, bags	lb.	.12½ –	.12¾

Fertilizers

Acid phosphate, 16%, wks.	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works 100	lb.	2.75 –	.....
Blood, dried, bulk	unit	3.85 –	3.95
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.75 –	.....
Nitrate of soda, bags 100	lb.	2.42½ –	.....
Tankage, high grade, f.o.b. Chicago	unit	3.00 –	3.25
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.00 –	3.50
Tennessee, 75%	ton	6.50 –	6.75
Potassium muriate, 80%, bags	ton	34.55 –	.....
Sulphate, bags, 90%	ton	45.85 –	.....
Double manure salt, bgs.	ton	26.35 –	.....
Kainit, 14%, bgs	ton	10.25 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.35½ –	$0.36
Upriver coarse	lb.	.26 –	.....
Plantation—First latex crepe	lb.	.36 –	.....
Ribbed smoked sheets	lb.	.36 –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.08 –	$0.10
East Indian, bold, bags	lb.	.13 –	.14
Manila, amber, bags	lb.	.14 –	.16
Damar, Batavia, cases	lb.	.27 –	.28
Singapore, No. 1, cases	lb.	.29 –	.29½
Singapore, No. 2, cases	lb.	.20 –	.21
Kauri, No. 1, cases	lb.	.58 –	.64
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.06 –	.12

Shellac

Shellac, orange fine, bags	lb.	$0.66 –	$0.67
Orange superfine, bags	lb.	.68 –	.69
Bleached, bonedry	lb.	.74 –	.75
T. N., bags	lb.	.64 –	.65

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh. ton	$300.00 –	$350.00
Shingle, f.o.b., Quebec	sh. ton	45.00 –	50.00
Cement, f.o.b., Quebec	sh. ton	15.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	17.00 –	17.50
Grd., off-color, f.o.b., Balt	net ton	13.00 –	14.00
Floated, f.o.b., St. Louis, bbl.	net ton	23.00 –	24.00
Crude f.o.b. mines, bulk	net ton	8.50 –	9.00
Casein, bbl., tech.	lb	.10½ –	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	6.50 –	8.00
Powd., f.o.b. Ga.	net ton	12.00 –	16.00
Crude, f.o.b. Va.	net ton	5.50 –	7.00
Ground, f.o.b. Va.	net ton	10.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 –	7.25
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 gr'd. Me.	long ton	19.00 –	20.00
No. 1 Can., f.o.b., mill, powd.	long ton	25.00 –	.....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½ –	.06
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.12 –	.12½
Tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.15 –	1.20
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, calcined	ton	35.00 –	42.50
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl.	lb.	.06 –	.08
Dom., ground, bbl.	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.25
Sand blast, f.o.b. Ind.	ton	2.25 –	3.50
Amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Glass sand, f.o.b. Ill.	ton	2.00 –	2.25
Soapstone, coarse, f.o.b., Vt., bags	ton	7.00 –	7.50
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	.....
200 mesh, f.o.b., Ga.	ton	8.50 –	10.00
325 mesh, f.o.b. New York, grade A	ton	14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 –	$2.85
Corning	bbl.	1.50 –	.....
Cabell	bbl.	1.45 –	.....
Somerset	bbl.	1.55 –	.....
Illinois	bbl.	1.37 –	.....
Indiana	bbl.	1.38 –	.....
Kansas and Okla. under 28 deg.	bbl.	.75 –	.85
California, 35 deg. and up	bbl.	1.40 –	.....

Gasoline, Etc.

Motor gasoline steel bbls.	gal.	$0.15 –	.....
Naphtha, V. M. & P. deod, steel bbls.	gal.	.14 –	.....
Kerosene, ref. tank wagon	gal.	.13 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.08½ –	.....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.34 –	$0.35
Bloomless, 30@31 grav.	gal.	.24 –	.....
Paraffin, pale 885 vis.	gal.	.16½ –	.17
Spindle, 200, pale	gal.	.25 –	.26
Petrolatum, amber, bbls.	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–43
2nd quality, 9-in. shapes, f.o.b. wks.	1,000	33–37
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
9-in. sizes, f.o.b., Birmingham	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	33–35
Silicon carbide refract brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls	ton	$200.00 –	......
Ferrochromium, per lb. of Cr, 1-2% C.	lb.	.30 –	......
4-6% C.	lb.	.10½ –	.11
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	105.00 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	32.00 –	33.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	1.80 –	2.00
Ferrosilicon, 10-12%	gr. ton	39.50 –	43.50
50%	gr. ton	72.00 –	75.00
Ferrotungsten, 70-80% per lb. of W	lb.	.85 –	.90
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.25 –	4.00

Ores and Mineral Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	.....
C.i.f. Atlantic seaboard	ton	18.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	4.00 –	4.50
Coke, furnace, f.o.b. ovens	ton	3.25 –	3.30
Fluorspar, gravel, f.o.b. mines, Illinois	ton	17.50 –	18.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½ –	.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.39 –	.41
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 –	.75
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½ –	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 –	.....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	.....
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten ore, scheelite, 60% WO_3 and over	unit	9.00 –	9.25
Tungsten, wolframite, white, 60% WO_3	unit	8.75 –	.....
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	12.50
Vanadium pentoxide, 76%	lb.	3.00 –	3.25
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.14 – $0.14¼
Aluminum, 98 to 99%	lb.	.27 – .28
Antimony, wholesale, Chinese and Japanese	lb.	.14½ – .14¾
Nickel, 99%	lb.	.29 – .33
Monel metal	lb.	.32
Tin, 5-ton lots, Straits	lb.	.55¼
Lead, New York, spot	lb.	.0865
Zinc, spot, New York	lb.	.0740
Silver (commercial)	oz.	.68¼
Cadmium	lb.	.60 – .62
Bismuth (500 lb. lots)	lb.	1.50 – 1.55
Cobalt	lb.	2.50 – 3.00
Magnesium, ingots, 99%	lb.	.90 – .95
Platinum, refined	oz.	117.00
Mercury 75	lb.	69.00 – 70.00
Tungsten powder	lb.	.95 – 1.00

Industrial Developments of the Week

New Construction and Machinery Requirements in the Process Industries

Some Opportunities This Week

Brass	Cleveland, O.
Brass	St. Louis, Mo.
Insecticides	Tacoma, Wash.
Laboratory	Washington, D. C.
Lime and Stone	Richmond, Mass.
Paint	Indianapolis, Ind.
Paint	Gadsden, Ala.
Paint	Cincinnati, O.
Phosphate	Lakeland, Fla.
Paper	Fort William, Ont.
Rubber	Oakville, Conn.
Rubber	Akron, O.
Varnish	Berkeley, Calif.

New England

Conn., Oakville—Autotyre Co., is having plans prepared for the construction of a 4 story, 60 x 180 ft. factory, estimated cost $200,000. Fletcher Thompson, Inc., 542 Fairfield Ave., Bridgeport, are architects.

Mass., Richmond — Pittsfield Lime and Stone Co., C. Sopher, Pres., 153 West 42nd St., New York City, N. Y., had plans completed for the construction of a plant. Estimated cost $200,000. R. T. Meade & Co., 13 East Fayette St., Baltimore, Md., are architects.

Middle Atlantic

D. C., Washington—Dept. of the Interior, F. N. Goodwin, Asst. Secy., will receive bids until Dec. 18 for supplying laboratory and other equipment for the Freedman's Hospital.

South

Ala., Gadsden—T. H. Stephens & Associates are having plans prepared for the construction of a paint factory.

Fla., Lakeland—Southern Phosphate Co. is having plans prepared for the construction of a new plant. G. B. Massey, Pres. Randolph-Perkins Co., Engineers, are designing and supervising the work.

Tenn., Jacksonville—DuPont Fibersilk Co., River Rd., is having plans prepared by the DuPont Engineering Co., Wilmington, Del., for an additional unit to plant on site of Old Hickory Powder Plant; estimated cost $2,000,000.

Middle West

Ill., Springfield—The City Commissioners, W. J. Spaulding, Comr. Pub. Property, will receive bids until Jan. 5, for improvements to the water system, including chemical handling equipment. Burns & McDonnell Eng. Co., 412 Interstate Bldg., Kansas City, Mo., are engineers.

Ind., Indianapolis — Finishing Products Co., 123 Chesapeake St., having plans prepared for the construction of a paint factory on 13th St. Estimated cost $45,000. Private plans.

Mich., Ann Arbor—University of Michigan having plans prepared for the construction of medical research laboratory on University Campus. Estimated cost $150,000. A. Kahn, 1000 Marquette Bldg., Detroit, is architect.

O., Akron—Goodyear Tire & Rubber Co., plans the construction of a 5 story, 120 x 400 ft. engineering building at East Akron, estimated cost $350,000 to $400,000.

O., Cincinnati—Otto Roth, 920 State Ave., having plans prepared for the construction of a 1 story, 100 x 175 ft. paint plant on Dutton St. Estimated cost $75,000. Austin Co., 2339 Boone St., are engineers.

O., Cleveland—Central Brass Mfg. Co., E. A. Eckhouse, Pres.-Treas., East 55th St., plans the construction of a 3 story, 63 x 122 ft. factory, estimated cost $100,000. Christian, Schwarzenberg & Gaeda, 1900 Euclid Ave., are architects.

This page is of value not only as a machinery market but also as an index of the general activity and growth of the industries served by Chem. & Met. The reports are gathered by our regular correspondents who are instructed to verify every detail. Requirements for new machinery will be published here free of charge.

West of Mississippi

Mo., St. Louis — More, Jones Brass & Metal Co., 314 North Broadway, awarded the contract for the construction of a 1 and 2 story brass foundry at Kingshighway and Manchester Rd., to Fruin-Colnon Construction Co., Merchants Laclede Bldg., estimated cost $400,000.

Far West

Calif., Berkeley—Furch & Nelson, 79 12th St., Oakland, have awarded the contract for the construction of a 1 story varnish factory at San Pablo and University Aves., to John Carson, 50 Yosemite St.; estimated cost $45,000.

Calif., San Francisco—Magner Bros., 114 9th St., awarded the contract for the construction of a 4 story factory at Napoleon and Jerrold Aves., for the manufacture of paint, to M. Fisher, 711 Mission St.; estimated cost $175,000.

Wash., Tacoma — D. Davenport, Rust Bldg,. plans the construction of a plant for the manufacture of insecticides, to ultimately produce 75,000 tons annually, estimated cost $150,000.

Canada

Ont., Fort William—Great Lakes Paper Co., A. H. Black, Pres., plans the construction of a new paper mill, estimated cost $2,000,000.

Unverified

Ark., Jonesboro—H. H. Faulkner, 508 Commerce Bldg., Kansas City, Mo., plans to construct a plant for the manufacture of gas from crude oil.

Fla., Tampa—The U. S. Export Chemical Co., 476 1st Ave., N., St. Petersburg, awarded the contract for two large sulphuric acid storage tanks, water tanks, etc., at super-phosphate factory across Tampa Bay, to J. S. Schofields Sons Co., Macon, Ga.

O., Cleveland—The Fuller Cleaning Co. awarded the contract for a cleaning plant at 7606 Carnegie Ave., to S. W. Emerson Co., 1836 Euclid Ave. Estimated cost, $160,000.

O., Wickliffe—The Clarke Chemical Co. has awarded the contract for a new plant to the Austin Co., 16112 Euclid Ave., Cleveland. Estimated cost, $50,000.

Incorporations

Accurate Steel Treating Co., 12 North Campbell Ave., Chicago, manufacture and deal in metals and their products, machinery equipment moulds. R. W. Brooks, T. E. Barker, John Probeck. (Correspondent: Banks, Harbour & Grotefield, 35 North Dearborn St.)

Acme Plating Works, Inc., Los Angeles, $40,000. Ray E. McCoy, J. D. Gordon, W. J. and A. E. Schulze and W. F. Wuller, all Los Angeles.

Beadenkopf Leather Co., manufacture, $100,000. Charles Glen Beadenkopf, Clarence M. Beadenkopf, Florence Salmon, Wilmington.

Bentley Paper Co., Inc., 1010 Keyser Bldg. Paul Y. Waters, Robert J. Gill and Brodnax Cameron, Baltimore, Md.

California Oil Residium Process Co., Los Angeles, $500,000. J. D. Fields, F. A. Leser, A. Phillips, V. B. Cheak and Clifford Hughes, all of Los Angeles. (Attorney, Meserve & Meserve, 215 West 7th St.)

Duane Remedies Corp., New York City, medicines, $300,000. F. J. Davis, H. M. Hogan, A. J. Russo. (Attorney, J. T. Smith, 224 West 57th St.)

Newark Vegetable Oil Co., oils, Hoboken, N. J., $125,000. Burke & Kirk, New York City.

Standard Chemical Products Co., Dover, Del., manufacture, $2,000,000. A. D. Burkhart, C. B. Arbogast, G. U. Brooks, Pittsburgh, Pa. (Capital Trust Co. of Delaware.)

Industrial Notes

The Taylor-Wharton Iron and Steel Co. has appointed Thomas K. Scott Mid-West sales manager, with Denver, Colo., as headquarters.

The Sullivan Machinery Co., Chicago, Ill., announces the establishment in Los Angeles, Calif., of a branch office and warehouse at 412 East Third St., with Benjamin P. Lane as local manager.

The Electric Heating Apparatus Co., 18 to 34 Nesbitt St., Newark, N. J., announces that it was succeeded, Dec. 1, by the Hevi-Duty Electric Co., 690 Kinnickinnic Ave., Milwaukee, Wis. All of the manufacturing and business pertaining to hevi-duty furnaces and multiple unit furnaces and hotplates will be carried on solely under the new name and at the new address.

The Central Steel Co., of Massillon, Ohio, manufacturer of Agathon alloy steels, announces the appointment of A. B. Cooper as its Philadelphia district sales manager with offices in the Widener Building. Mr. Cooper has been identified with the steel industry for 17 years in both operating and sales work and is well known in the Philadelphia territory, where he was formerly identified with the Tacony Steel Co. and the Penn Seaboard Steel Corporation.

The Cutler-Hammer Manufacturing Co., of Milwaukee, announces the addition to its industrial sales engineering force of the Eastern district T. E. Beddoe, at one time connected with the Pittsburgh and Chicago offices of the company. He is now located in the Philadelphia office. It is also announced that Paul Darlington, for the past 4 years in the industrial controller engineering department at the Milwaukee factory, has joined the New York staff.